For The Furnaces of Industry

Better Refractories

FIRE BRICK

JAY BEE MAXIMUL: High fired Super-duty—dry press

JAY BEE FINE: Super-duty quality—dry press

JAY BEE COARSE: Super-duty quality—dry press

MOREX: High-duty—dry press

AZTEX: High-duty—stiff mud

VIKING: Intermediate-duty—dry press

THOR: Intermediate-duty — stiff mud

BUNG: Special brick for malleable furnaces—dry press

ALUMEX 50; 60; 70: 50%, 60% 70% Alumina Quality Firebrick & Liners—dry press

INSULATING FIREBRICK:

M—26 for 2600° service
M—23 for 2300° service
M—20 for 2000° service

NATIONAL BRANDS

RAJAH (Regular): Super-duty quality—dry press

RAJAH (Coarse): Super-duty quality—dry press

BIG SAVAGE (All-Purpose): High-duty—dry press

BIG SAVAGE (Coarse): High-duty—dry press

BIG FOUR: Intermediate-duty—dry press

VAN DYKE SILICA: Superior quality silica brick

Special Shapes Furnished Per Specifications

●

REFRACTORY SPECIALTIES

MONO-FIBRIK: First quality plastic firebrick

SUPER MONO-FIBRIK: Super-duty quality plastic firebrick

MAX-BOND: High-strength, air-setting, super-duty plastic firebrick

HELSPOT: Special plastic firebrick for metallurgical processes

MONO-CHROME: Chrome base plastic refractory

HILOSET: First quality high temperature bonding mortar

SUPER HILOSET: Super quality high temperature bonding mortar

LO-SET: First quality high temperature bonding mortar

HY-SET: First quality high temperature bonding mortar

BOND SET: Silica base bonding mortar

MEX-LOX: Jointing material

M-5: Insulating firebrick high temperature mortar

FURNAS-CRETE: First quality castable refractory

SUPER FURNAS-CRETE: Super quality castable refractory

MILL-CRETE: Special refractory concrete for high temperature applications

BAFFLE CRETE: First quality castable for baffle construction

I-R-C: Light weight insulating refractory castable

I-R-C 20: Light weight insulating castable refractory concrete

CHROME CONCRETE: Chrome base refractory concrete

MEXICAST: Plastic refractory concrete

SPRAY MIX: First quality refractory coating

PLASTIC INSULATION: Insulating cement

HILO-CHROME: Chrome base high temperature bonding mortar

CATALOG

of

BETTER

MEX-R-CO

REFRACTORIES

Products

●

FIRECLAY BRICK

HIGH ALUMINA BRICK

SILICA BRICK

REFRACTORY SPECIALTIES

●

General Office

MEXICO REFRACTORIES COMPANY

MEXICO, MISSOURI, U. S. A.

●

District Sales Offices and Warehouses located in all Principal Cities and Industrial Centers

●

Affiliated with

NATIONAL REFRACTORIES COMPANY

Lewis Tower Building — Philadelphia, Pennsylvania

FORM NO. 62-R-105115

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TO OUR FRIENDS IN INDUSTRY

The story of "Better Refractories" is one of Service

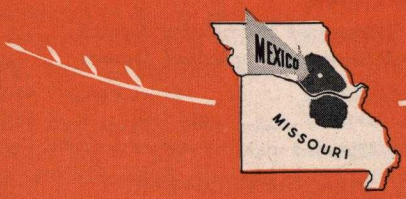
Despite war and depression, the years since 1930 have been marked by prosperity and progress for the Mexico Refractories Company. Progress has been conspicuous by the improvement of old products and the development of new, through the application of scientific research and advancements in technology.

Nature, with its generous supply of pure raw fire clays, the developments of an age of science, the efficiency of the modern machine, and the ingenuity and earnestness of man have combined to produce "Better Refractories."

The user of refractories has profited. Longer service life, more economical and efficient furnace operation, increased production . . . these and other benefits have resulted.

Encouraged and inspired by the generous and friendly acceptance of its products the Mexico Refractories Company looks forward to years of continued service in supplying "Better Refractories" for the Furnaces of Industry.

PRESIDENT



MEXICO REFRACTORIES COMPANY

PRODUCTS ARE RECOGNIZED AND ACCEPTED AS

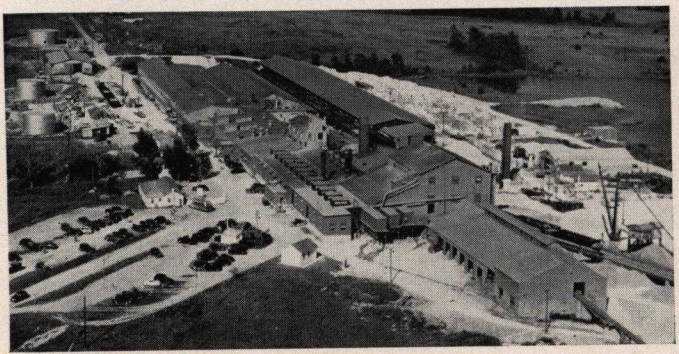
"Better Refractories"

● It was in 1929 that a small group of men—widely experienced in the science of research, fully trained in the technicalities of manufacture, capably skilled in the application and installation of refractories, and recognized as leaders in their respective fields—formed the MEX-R-CO organization. Convinced of the ever-growing demand for higher-grade, more serviceable refractories they adopted the slogan "Better Refractories", and proceeded to demonstrate their purpose.

Beginning modestly with a single dry press, one drier and one tunnel kiln, there are now in operation at the MEX-R-CO plant fourteen dry presses, eight driers and four tunnel kilns. Production facilities in all departments have been improved and increased to keep pace, so that the Mexico Refractories Company plant is one of the most modern in all phases of refractories manufacture.

The orbit of service was aggressively extended into the industrial East by the organization of the National Refractories Company, a sales organization with offices in Philadelphia, Pittsburgh and New York City, and the acquisition of two plants—Big Savage Refractories Company, Frostburg, Maryland, and Van Dyke Silica Works, Mifflintown, Pennsylvania.

Thus . . . with its unlimited supplies of choice raw materials, its unexcelled modern manufacturing equipment, and its highly developed facilities, the Mexico Refractories Company marches forward with a complete line of quality products "For the Furnaces of Industry", promising maintenance of quality in its products and a strict adherence to the high principles which prompted the establishment of "Better Refractories".



Aerial View of Mexico Refractories Company Plant at Mexico, Missouri.

MEXICO, MISSOURI

The "CAPITAL" of the Refractories Industry

● Located almost in the center of one of the purest fire clay districts in the world, the Mexico Refractories Company has at its disposal an abundant source of supply of the finest quality, highly refractory, fire clays.

In this district are found seven distinctly different Fire Clays of varying degrees of refractoriness and physical condition. These soft plastic to hard rock-like flint clays are all necessary to the manufacture of a complete line of refractory products. Due to the relatively high alumina and low impurity content of these clays, they possess a maximum of refractoriness and other physical properties essential in the making of high quality MEX-R-CO fire clay products.

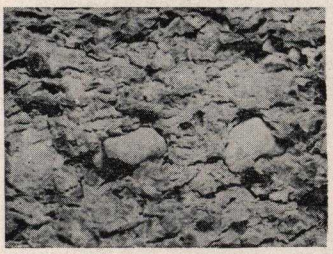
The modern plant, in which "Better Refractories" are manufactured, is situated adjacent to one of the largest and richest fire clay deposits in this district. Unlike most deposits, the fire clay in this vast pit was completely blanketed by several layers of caprock. For centuries, this natural sealing prevented seepage water and impurities from entering the clay bed, thus accounting for the remarkable purity of the fire clay. This, in turn, accounts in part for the consistently uniform quality of all Mex-R-Co products.

Five states to the east of Missouri is the Atlantic Ocean; five states to the west is the Pacific; two states to the north and south are Canada and the Gulf, respectively. Thus, almost in the geographic center of the United States lies Mexico, Missouri.

With convenient rail facilities, shipments of the many "Better Refractories" products—Firebrick and Specialties—can be safely and rapidly made to any point—or port—on the continent.

THE CORRECT REFRACTORY FOR EVERY CONDITION

● Modernized design, revolutionary changes in furnace operation, more efficient firing methods and mass-production have resulted in more exacting specifications for a wider range of properties and characteristics in firebrick products. To meet these demands for firebrick with definite physical and chemical characteristics, Mex-R-Co employs three different processes of manufacture—each requiring precision of blending of various clay materials—*Dry Press, Stiff Mud or auger machine, and Hand Molding.*

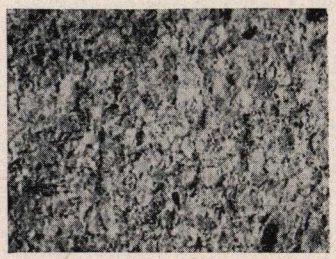


● **HAND MOLDING PROCESS.** The dobie is formed by hand and plunged into a wood or steel lined mold. Hand molding is limited primarily to the manufacture of special odd shapes that cannot be made by machine or when specifications require a more open-body, porous texture.

● **STIFF MUD PROCESS.** Here the clay is fed into a large pug mill where sufficient moisture is added to enable the revolving power auger to force the material through a controlled dimension die. The principle of de-airing has been applied to this process whereby all of the air is removed from the clay mass.

The Stiff Mud process of manufacture produces a dense, close, grained, tightly compacted structure. Characteristics of stiff mud refractories are maximum strength, resistance to abrasion and the corrosive action of slag.

● **DRY PRESS PROCESS.** In this process a blend of correct clay mixtures, containing little more than their natural moisture content, is pressed in a huge machine under tremendous pressure. Variations of pressure and clay blends produce brick of varying characteristics. The principle of de-airing is also applied to this method when specifications call for a more dense product.



This process is employed in the making of nine-inch shapes, square edge tile and special tile the size and shape of which make it feasible to manufacture by this method. The Dry Press process enables close control over grain sizing, strength and density of brick structure. It produces brick and tile of uniform size with sharp, smooth edges and of low spalling characteristics.

SUPER-DUTY FIRE CLAY BRICK

• The Mexico Refractories Company offers a complete line of "JAY BEE" Super-Duty Firebrick with characteristics that meet the specifications of modern industry with wide factors of safety. The outstanding characteristics of JAY BEE Super-Duty Firebrick are made possible by two factors: purity of clays, and careful control through each phase of the manufacturing process.

HIGH FUSION POINT—Brick seldom wear away solely by melting; but a low fusion point means poor resistance to load, volume change, and vitrification. Manufactured by the dry-press process, from purest Missouri flint clays, JAY BEE Brick have a P.C.E. of Cone 34. The high fusion point, then, is one reason for their excellent resistance to spalling, high load-bearing ability, unusual resistance to vitrification, and low permanent shrinkage.

RESISTS VITRIFICATION—One of the chief causes of refractory failure is vitrification. JAY BEE Brick resist vitrification because of the inappreciable amount of impurities in the clays, and their higher fusion point; they will withstand soaking heat for a longer time before sufficient chemical reaction can cause enough vitrification to damage them.

Upon subjecting Super-Duty Firebrick to long soaking heat at high temperatures, Mullite develops in the grain structure as interlocking microscopic crystals. This formation is beneficial because it forms slowly without disturbing the structure with violent volume changes; it also improves the resistance to shrinkage and thermal shock, as well as improving the load-bearing ability.

RESISTS HEAVY LOADS—JAY BEE Brick have exceptional load-bearing ability. With a tough, solid, rock-like structure resulting in a definite immunity to deformation, walls built with JAY BEE Brick will not bulge or crack; solid walls prevent the leakage of gas and infiltration of air.

UNUSUAL SPALLING RESISTANCE—Unusually low spalling loss is one of the main characteristics of JAY BEE Brick, enabling their use in furnaces operating up to 3000° F. and having rapidly fluctuating temperatures. This spalling resistance is chiefly due to: (a) special blending of pure clays, (b) uniformity of texture, (c) low vitrification at high temperatures.

CONSTANT IN VOLUME—JAY BEE Brick retain their original shape and structure throughout a very wide temperature range. Due to greater stability, JAY BEE Super-Duty Brick are not so susceptible to erosion from slags, to attack by impinging flame action, to thermal shock, or to other destructive forces that tend to shorten the life of firebrick.

NEGLIGIBLE SHRINKAGE—Superior quality clays, the high temperature firing process, and the elimination of volume changes account for JAY BEE Brick having low permanent shrinkage at high temperatures. This low volume change means fewer open joints or cracks in furnace walls, and elimination of loose brick work—all resulting in better furnace efficiency.

JAY BEE FINE

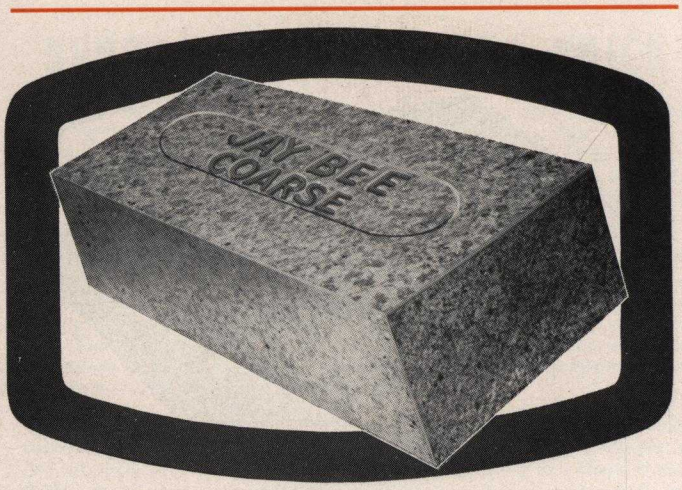
SUPER-DUTY FIREBRICK

SUPERIOR RESISTANCE TO DESTRUCTIVE SLAG ATTACK

● The JAY BEE FINE super-duty firebrick is best known for its outstanding characteristic of high resistance to severe slag attack. The name "FINE" is derived from its fine tight grain structure. Manufactured by the Dry Press process, it is uniform in size and of perfect workmanship. Of low porosity, and high in P.C.E. value, JAY BEE FINE is recommended for high temperature furnaces where destructive slags rapidly wear away other refractories. JAY BEE FINE has much better spalling resistance than first quality firebrick. It is ideally suited for use in many stoker, powdered-coal and oil-fired boilers, and in various industrial and metallurgical furnaces where resistance to slag, load-bearing ability, minimum shrinkage and spalling resistance are required.

TYPICAL APPLICATIONS FOR WHICH "JAY BEE FINE" SUPER DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Aluminum Furnaces	Reverberatory Hearths; Floors
Billet Heating Furnaces	Roofs and Sidewalls (Hot Zone)
Blooming Mill Furnaces	General Structure
Ceramic Kilns	Piers; General Construction
Crucible Melting Furnaces	General Structure
Forge Furnaces	Sidewalls
Foundry Ladles	Linings (Special Applications)
Gas Generators	Carburetor and Super-Heater; Checkers
Glass Furnaces	Checkers
Heavy Duty Boilers	Flat, Suspended Arches; Furnace Walls; Suspended Walls; Sprung Arches
Incinerators	Furnace Roofs
Malleable Furnaces	Bottoms
Oil Stills	Firing Chambers
Open Hearth Furnaces	Checkers
Reheating Furnaces	General Structure
Rotary Kilns and Roasters	High Heat Zones
Skelp Furnaces	Bottoms



JAY BEE COARSE

SUPER-DUTY FIREBRICK

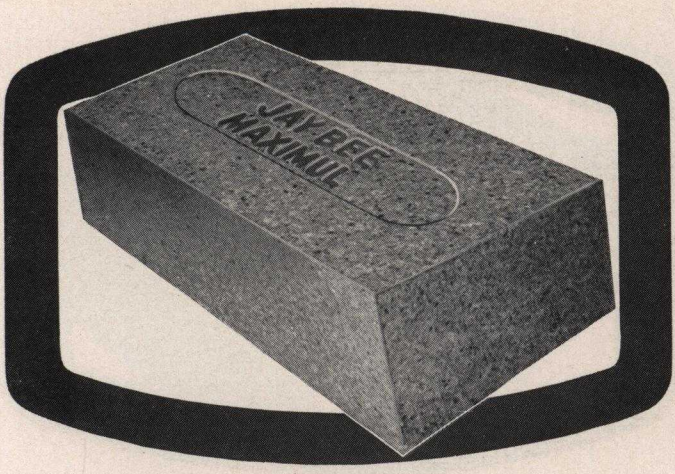
SUPERIOR RESISTANCE TO SPALLING AND VITRIFICATION

● When tested according to A.S.T.M. specifications the JAY BEE COARSE brick shows less spalling loss than other super-duty firebrick. This outstanding characteristic is predominant among its many properties.

Manufactured by the Dry Press process, from highly refractory Missouri clays, the JAY BEE COARSE brick is uniform in structure and physically perfect. A special blending of the pure clays used in its manufacture enables it to better withstand thermal shock caused by the rapid fluctuations of furnace temperatures. It has high resistance to vitrification, can withstand soaking heats for a longer time, and is noted for its ability to maintain a stable structure in service. JAY BEE COARSE may be used in oil, gas, and stoker or powdered-coal fired furnaces where the essential requirements are superior non-spalling, non-shrinkage and load resistance properties, but where resistance to thin penetrating slags is of less importance.

TYPICAL APPLICATIONS FOR WHICH "JAY BEE COARSE" SUPER DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Billet Heating Furnaces	Walls and Roofs
Boilers	Walls; Suspended Arches
Ceramic Kilns	Side Walls; Burner Ports; Arches
Electric Furnaces	Roofs
Enameling Furnaces	Flues; Combustion Chambers; Piers
Forge Furnaces	Roofs; Sidewalls
Gas Plants	Supporting Arches for Checkers
Gypsum Pots	Flue Systems; Piers
Heat Treating Furnaces	Flues; Combustion Chambers
Malleable Furnaces	Roofs
Magnesium Melting Furnaces	Sidewalls in pot-type Furnace
Oil Stills	Firing Chambers
Portable Alfalfa Dehydrators	Oil Fired Furnace Linings
Portable Asphalt Heaters	Oil Fired Furnace Linings



JAY BEE MAXIMUL

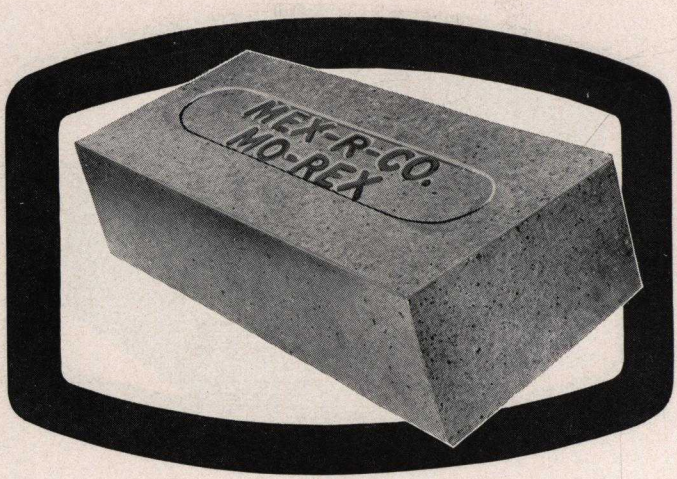
SPECIAL SUPER-DUTY FIREBRICK

WITHSTAND ABRASION, SEVERE SLAG, DEFORMATION

● The JAY BEE MAXIMUL Brick, manufactured by the Dry Press process, is designed for use where very severe slagging and abrasive conditions are encountered. It is burned in a special tunnel kiln, operated at slow speed, and at an extremely high soaking temperature, causing a chemical reaction which alters the grain structure and forms a crystalline mass which is partly converted to mullite. This change produces a tough, solid, rock-like body with great stability at high temperatures, giving it excellent resistance to deformation and producing a dense, impenetrable surface which is impervious to slag attack and highly resistant to clinker adhesion. The JAY BEE MAXIMUL super-duty brick will not shrink in service, and its extreme density, rigidity and stability at high temperatures assure longer service life.

TYPICAL APPLICATIONS FOR WHICH "JAY BEE MAXIMUL" BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Aluminum Scrap Melting Furnaces	Slag Line; Bottom
Billet Heating Furnaces	Floor (In Hot Section)
Boilers	Slagging Areas in Walls
Ceramic Kilns	Firing Section; Piers
Forge Furnaces	Floor; Jambs
Foundry Cupolas	Combustion Section (Special Applications)
Glass Tanks	Checkers; Ports; Uptakes; Regenerator Walls
Heat Treating Furnaces	Floor
Lime Kilns	Lining
Malleable Furnaces	Skimming and Inspection Door Tile; Brick Bottom
Open Hearths	Checkers; Lower Part of Front Wall; Underneath Rammed Linings along Front and Back Sides
Reverberatory Brass Melting Furnaces	Walls; Roof
Rotary Kilns and Roasters	Hot Zone Linings
Soaking Pits	Sidewalls and Crown or Roof
Steel Holding Furnaces	Bottom; Sides



MO-REX

FIRST QUALITY, HIGH-HEAT DUTY FIREBRICK

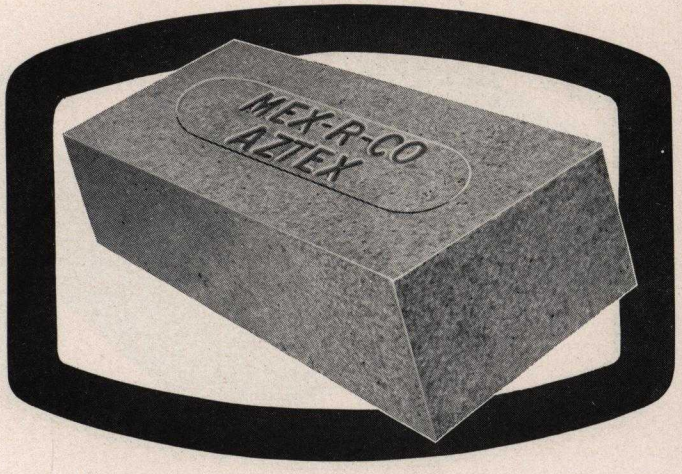
(Manufactured by Dry Press Process)

● MO-REX Firebrick are most suitable for general furnace construction because of their many characteristic qualities: Resistance to slag attack; Ability to withstand temperature shock; Exceptional load bearing ability; Low coefficient of expansion; High fusion (P.C.E. of Cone 33—3173° Fahr.)

MO-REX Firebrick are manufactured by the Dry Press process, from flint clays high in refractoriness and with a marked absence of impurities. They are uniform and accurate in size and are burned in the latest type tunnel kilns. Unless unusual conditions are encountered in operation—such as severe spalling, excessive temperatures, exceptional slag—MO-REX Firebrick can be safely recommended for general use in furnace construction.

TYPICAL APPLICATIONS FOR WHICH MO-REX HIGH-HEAT DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Aluminum and Magnesium Melting Furnaces	Upper Walls; Roof
Annealing Furnaces	General Use
Bake Ovens	Tile; Walls
Billet Heating Furnaces	General Use
Boilers (All Kinds)	Walls; Arches; Stack Lining
Ceramic Kilns	General Use
Coke Ovens	General Brick Structure
Enameling Ovens	Side Walls
Forge Furnaces	General Use
Glass Tanks	Lower Checkers; Checker Chamber Walls
Heat Treating Furnaces	General Use
Large Incinerators	Furnace Walls; Roof and Flues
Oil Stills	General Use
Open Hearths	Flues; Checker Chamber Wall and Roof Structure
Rotary Kilns (Cement-Lime)	Flues; Hoods; Waste-heat Boilers and Stacks
Soaking Pits	Walls; and Covers
Shaft Lime Kilns	Linings and Furnaces
Steel Mills	General Purpose Brick
Stoves (Blast Furnace)	Linings



AZTEX

FIRST QUALITY, HIGH-HEAT DUTY FIREBRICK

(Manufactured by the Stiff Mud Process)

● The AZTEX brand of Mex-R-Co Firebrick is considered superior in many aspects—abundance of desirable properties, wide variety of applications, ability to meet the untempered requirements of furnace operation, and length of service life. It is dense, tough, solid. Compounded from chemically uniform and pure Missouri flint and plastic clays the AZTEX is primarily for use in furnaces operating at moderate-to-high temperatures, and where resistance to slag attack, abrasion and chemical corrosion are important. P.C.E. is Cone 33—3173° F.

TYPICAL APPLICATIONS FOR WHICH AZTEX HIGH-HEAT DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Boilers	Walls at Slag Line, Floor, Jambs, Lintels (where mechanical abrasion is severe). Complete setting when exposed to substantial amount of slag attack
Ceramic Kilns	Floor, Fire Boxes, Jambs, Ledges and Ports (where attacked by salt glazing)
Chemical Processing	Resistant to chlorine and alkaline fumes at high temperatures
Forge Furnaces	Floor
Foundry Cupolas	Lining, Ladles, Run-Spouts, Breast Brick
Frit Smelters	Main Lining
Heat Treating Furnaces	Floor
Incinerators	Walls, Doors, Feed Openings
Lead Softening Furnaces	Side Walls and Roof
Malleable Furnaces	Sidewalls
Oil Stills	Catalyst Regenerator Lining, Sludge Burning Furnaces
Open Hearths	Checkers
Rotary Kilns	Cold and Intermediate Zone, Nose Ring Blocks Clinker Chute Lining
Shaft Lime Kilns	Lining (use Keys & Straights)
Soaking Pits	Curb and Walls

For suspended arch tile, (exposed to fumes, slags, abrasion) Use AZTEX quality.

VIKING

INTERMEDIATE-HEAT DUTY FIREBRICK

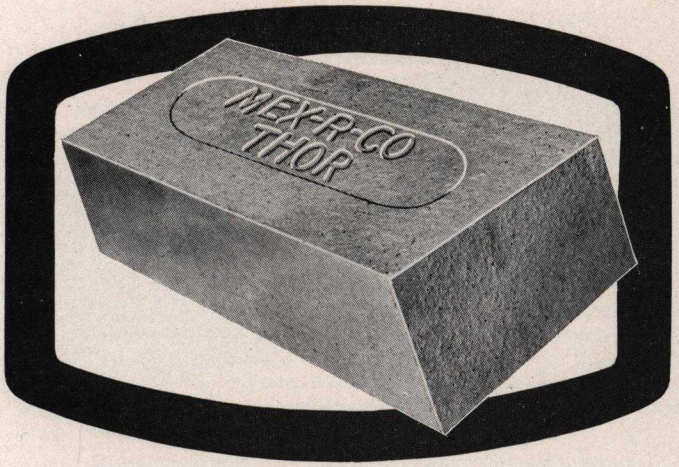
● The same high-quality workmanship that characterizes higher priced Mex-R-Co products goes into the VIKING brand of Mex-R-Co firebrick. Manufactured by the Dry Press process and tunnel kiln burned it is perfectly uniform in size, with square corners and edges, and will lay up with thin joints to produce a smooth, even wall. The plastic clay used in its manufacture is of unusually high quality, being low in iron and noteworthy for the absence of impurities. The VIKING has a "clean cut" texture and is well compacted together with a uniform body structure. It maintains a stable volume at working temperatures; it is resistant to hot metal, moderate slag and rapid temperature change.

The VIKING is a serviceable and economical brick for general furnace use where temperatures are not extreme and where operating conditions are moderate.

On high-grade brick jobs of any description the VIKING is recommended as a suitable back-up brick

TYPICAL APPLICATIONS FOR WHICH VIKING INTERMEDIATE-HEAT DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Annealing Ovens	General Structure
Bake Ovens	General Structure
Billet Heating Furnaces	Walls and Roof
Boilers (High Temperature)	Second and Third passes; Stack
Boilers (Moderate Temperature)	Main Lining; Stack
Ceramic Kilns	General Structure
Checker Chambers	Walls and Flues
Copper Smelters	General Use; Matt Boxes; where Arsenic Fumes are Found
Glass Lehrs	General Use
Heat Treating Furnaces	Walls and Roof
Incinerators	Flues; Stack
Miscellaneous Metallurgical Furnaces	Linings



THOR

INTERMEDIATE-HEAT DUTY FIREBRICK

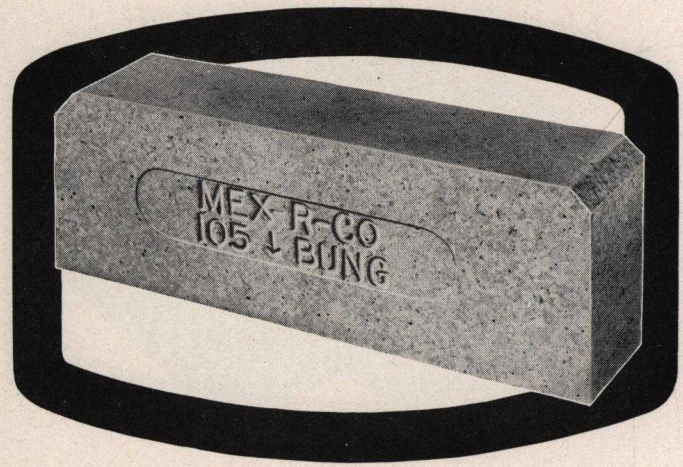
● The THOR brand of Mex-R-Co firebrick is a duplicate of the VIKING brand from the standpoint of clay composition and fusion point, and it may be used for many of the same purposes as the AZTEX—(but at a lower operating temperature level).

Manufactured by the Stiff Mud, or auger mahine method, and extruded under high vacuum, the THOR possesses properties characteristic of this method of manufacture. It is a dense brick with a hard, tough structure, and without laminations. It is strong mechanically, being excellent for resisting abrasion, slag penetration and clinkering.

The THOR Brick has a maximum resistance to mechanical wear and is consequently unexcelled for cupola patch work, for lining ladles and runners, for hearths and the lower walls of non-ferrous metal melting furnaces, and for firebox linings where coal and coke are burned. The THOR is highly recommended as a back-up brick for AZTEX were an all-firebrick setting is required. An adequate stock of THOR Brick is carried at all times.

TYPICAL APPLICATIONS FOR WHICH THOR INTERMEDIATE-HEAT DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Annealing Ovens	Floor; Doors
Boilers (High Temperature)	Back-up; Ash Pit; Stack
Boilers (Moderate Temperature)	Slag Line; Ash Pit; Stack
Gas Generators	Checkers
Grey Iron Foundries	Ladles and Cupola Maintenance
Heat Treating Furnaces	Floor and Doors
Miscellaneous Roasting Furnaces	Linings
Oil Stills	Fluid Catalyst Regenerator Chambers
Open Hearth	Checkers
Rotary Kilns	Clinker Cooler Lining
Steel Mills	Checkers and Miscellaneous Runners and Spouts
Steel Mill Ladles	Back up for Lining in Large Ladles



BUNG BRICK

SPECIAL BRICK FOR MALLEABLE FURNACE ROOFS

● MEX-R-CO BUNG brick are highly specialized firebrick designed for a single purpose—that of lining the roof of malleable air furnaces, where intense heat, extreme spalling and sudden temperature changes are encountered regularly. Among the outstanding characteristics of MEX-R-CO BUNG brick are: high fusion; non-spalling; good mechanical strength; resistance to vitrification; non-shrinking; low volume change; uniformity of size.

Recognizing the severity of service in malleable furnaces, MEX-R-CO technicians have developed a "bung mix" that adequately meets all conditions of service. Fairly coarse in structure, MEX-R-CO BUNG brick have ample physical and mechanical strength to withstand the tight compression of clamping in the bung frame and to successfully resist the sudden cooling and heating during charging. The special grain sizing further results in a very slight expansion which produces a tight roof. All BUNG arch brick are chamfered at the ends to indicate the top of the 3" side. This makes it easier and quicker to fill the frames and avoid the "upside down" bung that sometimes gets into the arch.

MEX-R-CO BUNG brick are strictly a malleable roof brick; they are not designed for use in furnace side walls or in areas where heavy slag attack is encountered. Bung Brick should not be abused by rough handling. Because of their size and shape, and due to their comparatively open structure the use of reasonable care in handling is strongly advised.

MALLEABLE FURNACE SIDE WALL AND BOTTOM BRICK

● MEX-R-CO SIDE WALL brick are highly refractory and highly resistant to slag penetration, thus adequately meeting the principal cause of side wall failure due to corrosive action of slag high in iron oxide; malleable furnace operators find slag attack most severe at or near the slag line with undercutting or severe abrasive action taking place. Above the slag line, high refractoriness and ability to withstand corrosion by fuel ash and molten slag is essential. MEX-R-CO SIDE WALL brick will meet these rigid requirements satisfactorily.

● MEX-R-CO BOTTOM brick are carefully burned to uniform size, and are manufactured of a fine, dense structure enabling this refractory to withstand severe slag attack and abrasion. However, it is suggested they be laid with a high temperature bonding mortar and keyed very tightly to prevent floating caused by metal penetration of the joints.

● *Inasmuch as all three types of malleable furnace brick are manufactured at one plant, this enables Mexico Refractories Company to make up a mixed carload of Bung, Side Wall and Bottom brick with its obvious advantages. It allows flexibility in filling requirements and helps to control inventory stockpiling.* *See page 27 for dimensions of various Bung Brick.*

PALLETIZING

● The advantages of mechanized handling and palletizing in the movement and storage of firebrick and packaged refractory products are—(1) improves efficiency of handling procedure, (2) expedites loading and unloading of freight cars, (3) facilitates ease of storage, (4) cuts down abuse and rough handling, (5) reduces labor expense.

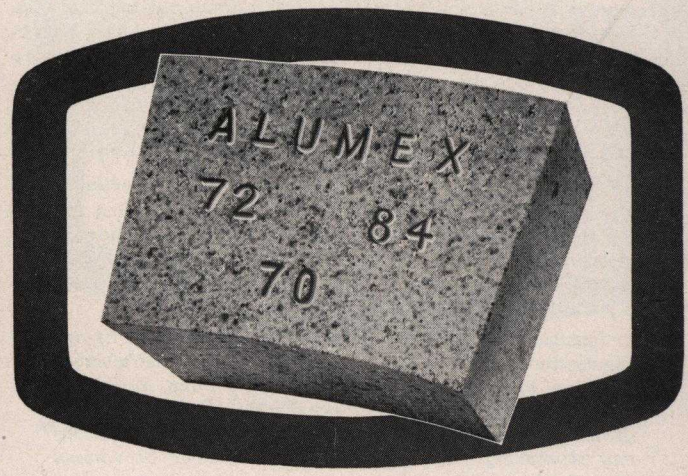
Many users of refractories are now employing lift trucks and requesting palletized shipments. The MEX-R-CO Shipping Department is fully equipped to accommodate customer preferences, making pallet loading service available where desired.

A thorough study of pallet loading and storage has been made, noting particularly the requirements of pallet construction to facilitate ease of unloading, and safety in movement and storage. The standardized overall size of pallets is 36"x48", with three 2"x3" runners. The capacity of a pallet is approximately 480-9" equivalent. Loaded pallets are made secure for shipping and for storage by the use of specially designed end and side gates.

Pallets in usable condition are returnable, and credit will be allowed.

ALUMEX BRICK AND LINERS

(High Alumina Refractories)



● High Alumina fire brick are just what the name implies. They are made from Diaspore which is a mineral having an alumina content of from 70% to about 80%. The only known commercial deposits are in the Ozark Mountains a short distance south of Mexico. The Company owns a number of deposits, sufficient for many years.

High Alumina refractories successfully resist much higher temperatures than fire clay brick, will better withstand non-ferrous slags and have great strength. They are however, susceptible to slags in which iron oxide is present in appreciable quantities. Under certain specific conditions, high alumina brick are invaluable and far superior to fire clay brick, but they are not a cure all for every refractories problem.

ALUMEX "70"

● ALUMEX "70", having a very high content of alumina is highly refractory, its P. C. E. being Cone 36 to 37. Its negligible shrinkage at high heats, ability to sustain great weight, and great resistance to non-ferrous slags and metals are noteworthy features. In a great many Portland cement plants it is the standard refractory where, in the hot zones of kilns, it readily acquires and retains a good coating.

The ALUMEX "70" is for use in rotary lime and cement kilns, in enameling furnaces and glass plants, in furnaces for melting brass and refining lead, and in oil and gas fired furnaces where extreme temperatures are carried. Splendid results will be obtained in boiler settings at very high ratings, when the slags are not high in iron.

ALUMEX "60"

● ALUMEX "60", is not quite as refractory as ALUMEX "70", its P. C. E. being Cone 35, which is due to its lower alumina content. It has however, quite a margin over fire clay brick in this respect. Its other characteristics are the same as the ALUMEX "70" brand and it is intended for use in the same types of service, but where operating conditions are not quite so severe.

ALUMEX "50"

● ALUMEX "50", as the brand name implies, is in the 50% alumina content class. Its fusion point or P. C. E. is 34-35. It has high resistance to spalling. Other properties are: great strength, and minimum volume change at high operating temperatures. It is not greatly affected by either non-ferrous or ferrous slags and is designed for use where fire clay brick are not sufficiently refractory and where spalling conditions are present.

TYPICAL APPLICATIONS FOR WHICH "ALUMEX" HIGH ALUMINA BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
ALUMEX-70	
Cement Kilns	Hot Zone
Miscellaneous Furnaces	Localized Very Hot Areas
Reverberatory Lead Dross Furnaces	Roof
Rotary Lime Kilns	Hot Zone
ALUMEX-50	
Boiler Furnaces	Wall
Cement Kilns	Intermediate Zone
Ceramic Kilns	Furnace Zone
Roasting Kilns	Hot Zone

TYPE OF FURNACE	WHERE USED
ALUMEX-60	
Boiler Furnaces (Oil- or Gas-fired); Operating at very high temperatures and under extremely heavy loads	Lining
Cement Kilns	Hot Zone
Ceramic Kilns (High Temperature)	Piers and Flues in Floor; Cartops; Furnace Zone
Enameling Furnaces	Piers; Flues
Heating Furnaces	Piers; Flues
Oil Stills and Heaters	Combustion Tunnels
Reverberatory Air or Holding Furnaces (Special)	Roof

KILN LINERS

● The excellence of liners manufactured by the Mexico Refractories Company for use in Portland Cement and Lime Kilns is well accepted. The raw materials put through these kilns require very high temperatures and have a highly corrosive action on the liners. High Alumina liners, our ALUMEX brands, are widely used in the hot zones of kilns, where they regularly outlast fireclay liners by more than two or three to one. They are highly refractory, tough, and resistant to spalling and abrasion. They are accurate and uniform in size and workmanship and are free of warped surfaces. *(See pages 26 and 82-84 for complete tables of sizes of Kiln Liners.)*

INSULATING FIREBRICK

M-26 FOR 2600° SERVICE • M-23 FOR 2300° SERVICE M-20 FOR 2000° SERVICE

● In recent years advancement in the manufacture of Insulating Firebrick has been rapid, due to the widening increase in the number of industrial applications in which this type of brick has been found economically suitable. At first the prime function of insulating firebrick was for backing up refractory brick, serving to decrease the heat flow through the furnace wall. With the development of insulating firebrick for fire-face service or direct heat exposure, other advantages become apparent—reduction of furnace wall thickness; uniform heating; increased production capacity; reduction of heat-up time; increased savings in fuel; reduction of floor space requirements (due to thinner walls); saving in installation labor cost; speed of cooling; more flexible operation. They are accepted for a wide range of applications.

They combine all the characteristics required for a highly efficient insulating refractory—high heat resistance; maximum insulating qualities; low heat absorption; good tensile strength; unusual load bearing capacity. In fire-face service the naturally high insulating and radiant properties of the MEX-R-CO brands of Insulating Firebrick make them distinctly economical in the respective heat ranges.

Insulating firebrick are not recommended for use beyond their stated heat range or in locations where they will be subject to mechanical abrasion, excessive vibration, severe thermal shock, flame impingement, or in contact with molten slags or metals.

APPLICATIONS

Air Heaters
Enameling Furnaces
Ceramic Kilns
Tempering Furnaces
Annealing Furnaces
Glass Lehrs
Oil Stills
Baking Ovens
Core Ovens
Oil Heaters
Nitriding Furnaces
Brazing Furnaces
Boiler Furnaces (gas fired)
Carbonizing Furnaces
Normalizing Furnaces
Stress Relieving Furnaces
Carburizing Furnaces
Malleableizing Furnaces
Heat Treating Furnaces
Checker Chamber Walls (where fume and slag not present)

COMPARISON OF PROPERTIES

DESCRIPTION	M-20	M-23	M-26
P. C. E.	Cone 17 to 18	Cone 18	Cone 32
Temperature Limit on Hot Face of Brick	2000° F.	2300° F.	2600° F.
Weight	2.35 lbs.	2.65 lbs.	2.7 lbs.
Cold Crushing Strength	115 lb./sq. in.	135 lb./sq. in.	380 lb./sq. in
Modulus of Rupture	60 lb./sq. in	65 lb./sq. in.	222.7 lb./sq. in.
Density	40 lb./cu. ft.	45.1 lb./cu. ft.	45.2 lb./cu. ft.

MORTARS AND CLAYS

Mex-R-Co Mortar This is a special mortar in which the usual shrinkage of purely fire clay mortars has been eliminated. Ground extremely fine, it allows tighter joints than are possible with fire clay and it is smooth working for the same reason. The clays used in it are the same fine quality clays that go into "MO-REX" brick. It is intended for very particular mortar work in place of fire clay. It is ordinarily furnished with a 50% calcined material content, but can be supplied with greater amounts. Put up in 100 lb. bags.

Dry Milled Fire Clay Mex-R-Co Dry Milled Fire Clay possesses the combination of properties so desirable in good fire clay. It is free from grit and very plastic, so that it makes a smooth working mortar. It makes a good bond when only dried, and has a high fusion point. It is unusually uniform in all these qualities. It can be furnished ground to various degrees of fineness for special purposes.

High Alumina Clay This is for making mortars of sufficient refractoriness for use with High Alumina brick, which in general, should be laid with High Alumina Clay to secure the best results. It is ground very fine. Put up in 100 lb. bags.

Foundry Clay This grade of ground clay is well adapted to patching and mudding up cupolas, malleable furnaces, and for general foundry use. Cupola patches will glaze over, become hard and strong, and keep out slags.

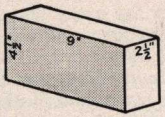
Crude Clays Various industries use fire clays for widely assorted purposes. Crude, unground, bulk clays from our deposits can be furnished for special purposes.

Ground Fire Brick This material, usually termed "Grog" or "Calcined Clay," has numerous applications. It is mixed with fire clay to reduce mortar shrinkage and for various patching mixtures. It has a high fusion point, and can be furnished ground to various degrees of fineness. Put up in 100-lb. bags.

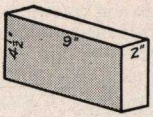
CEMENT GUN

● For surfacing walls with HILOSET and for applying coatings of SPRAY MIX, spraying with a cement gun is the better method. Upon request we will gladly furnish a blue print of a simple and efficient gun which can be economically made of pipe fittings.

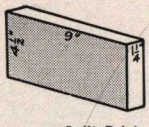
STANDARD 9" x 4½" x 2½" SERIES SHAPES



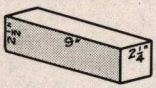
9" Straight
9"x 4½"x 2½"



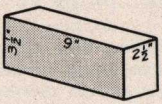
2" Brick
9"x 4½"x 2"



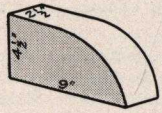
Split Brick
9"x 4½"x 1¼"



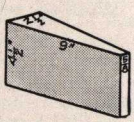
Soap
9"x 2½"x 2¼"



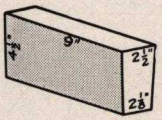
Small 9" Brick
9"x 3½"x 2½"



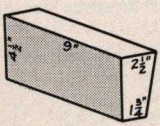
Jamb Brick
9"x 4½"x 2½"



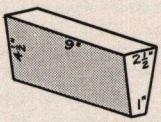
No. 3 Neck Brick
9"x 4½"x (2½"-⅝")



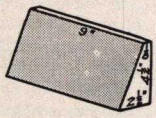
No. 1 Arch
9"x 4½"x
(2½"-2⅛")



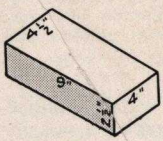
No. 2 Arch
9"x 4½"x
(2½"-1¾")



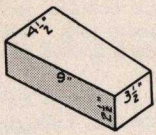
No. 3 Arch
9"x 4½"x
(2½"-1")



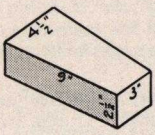
Feather Edge
9"x 4½"x
(2½"-⅛")



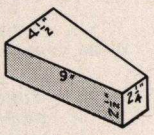
No. 1 Key
9"x (4½"-4")
x 2½"



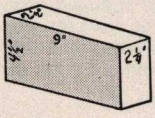
No. 2 Key
9"x (4½"-3½")
x 2½"



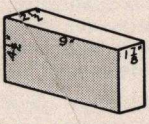
No. 3 Key
9"x (4½"-3")
x 2½"



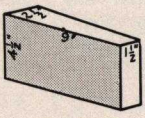
No. 4 Key
9"x (4½"-2¼")
x 2½"



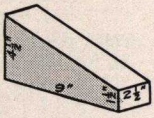
No. 1 X Wedge
9"x 4½"x
(2½"-2¼")



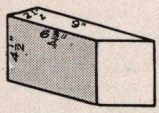
No. 1 Wedge
9"x 4½"x
(2½"-1⅛")



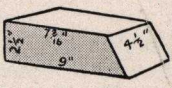
No. 2 Wedge
9"x 4½"x
(2½"-1½")



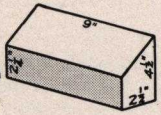
Edge Skew
9"x (4½"-1½")
x 2½"



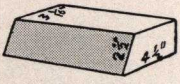
48° End Skew
(9"-6¾")
x 4½"x 2½"



60° End Skew
(9"-7/16")
x 4½"x 2½"

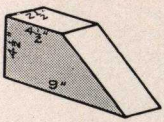


48° Side Skew
9"x (4½"-2¼")
x 2½"

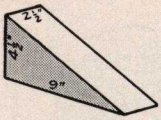


60° End Skew
9"x (4½"-3/16")
x 2½"

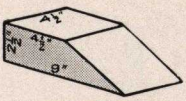
SPECIAL MODIFIED 9" x 4½" x 2½" SERIES SHAPES



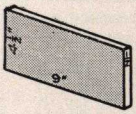
Angle "A" Skew
(9"-4½") x 4½"x 2½"



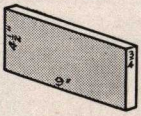
Angle "B" Skew
(9"-) x 4½"x 2½"



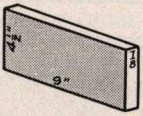
Angle "C" Skew
(9"-4½") x 4½"x 2½"



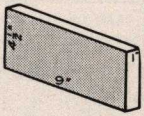
½" Split Brick
9"x 4½"x ½"



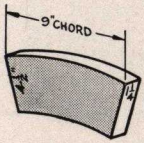
¾" Split Brick
9"x 4½"x ¾"



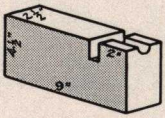
⅞" Split Brick
9"x 4½"x ⅞"



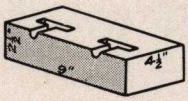
1" Split Brick
9"x 4½"x 1"



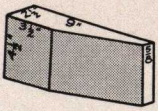
Circle Split
9"x 4½"x 1¼" (24-33)
9"x 4½"x 1¼" (36-45)
9"x 4½"x 1¼" (48-57)



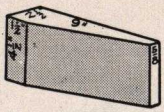
B-21280 Anchor
(Mex-111)
9"x 4½"x 2½"



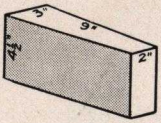
B-100 Marine Boiler Tile
(Mex-289)
9"x 4½"x 2½"



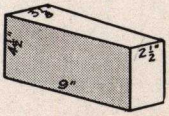
No. 1 Neck Brick
(9"-3½") x 4½"x
(2½"-⅝")



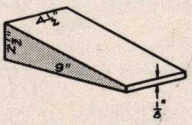
No. 2 Neck Brick
(9"-1½") x 4½"x
(2½"-⅝")



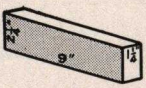
No. 3 Wedge
9"x 4½"x (3"-2")



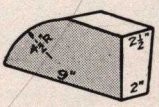
Bullhead Brick
9"x 4½"x (3⅛"-2½")



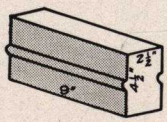
End Feather Edge
9"x 4½"x (2½"-⅛")



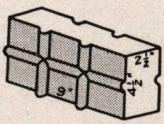
Soap Split
9"x 2¼"x 1¼"



Arch Jamb Brick
9"x 4½"x (2½"-2")

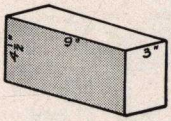


Single Tongue & Groove
9"x 4½"x 2½"



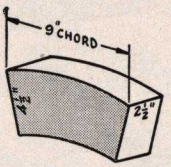
Double Tongue & Groove
9"x 4½"x 2½"

STANDARD 9" x 4½" x 3" SERIES SHAPES



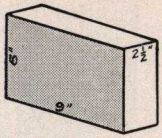
NAME OF BRICK	DIMENSIONS	NAME OF BRICK	DIMENSIONS
9" STRAIGHT	9"x 4½"x 3"	No. 1 ARCH	9"x 4½"x (3"-2¾")
SMALL 9" BRICK	9"x 3½"x 3"	No. 2 ARCH	9"x 4½"x (3"-2½")
SPLIT BRICK	9"x 4½"x 1½"	No. 3 ARCH	9"x 4½"x (3"-2")
SOAP	9"x 3"x 2¼"	No. 4 ARCH	9"x 4½"x (3"-1")
JAMB BRICK	9"x 4½"x 3"	FEATHER EDGE	9"x 4½"x (3"-⅛")
No. 1 WEDGE	9"x 4½"x (3"-2¾")	NECK BRICK	9"x 4½"x (3"-⅝")
No. 2 WEDGE	9"x 4½"x (3"-2½")	EDGE SKEW	9"x (4½"-1½") x 3"
No. 3 WEDGE	9"x 4½"x (3"-2")	48° END SKEW	(9"-6$\frac{3}{16}$") x 4½"x 3"
No. 1 KEY	9"x (4½"-4") x 3"	48° SIDE SKEW	9"x (4½"-1$\frac{13}{16}$") x 3"
No. 2 KEY	9"x (4½"-3½") x 3"	60° END SKEW	(9"-7¼") x 4½"x 3"
No. 3 KEY	9"x (4½"-3") x 3"	60° SIDE SKEW	9"x (4½"-2¾") x 3"
No. 4 KEY	9"x (4½"-2¼") x 3"		

STANDARD 9" x 4½" x 2½" CIRCLE BRICK

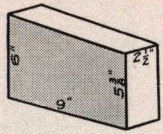


NAME OF BRICK	DIMENSIONS	DIAMETER		Number of Brick to Circle
		Inside	Outside	
24- 33 CIRCLE	(9"-6$\frac{17}{32}$") x 4½"x 2½"	24"	33"	12
36- 45 CIRCLE	(9"-7$\frac{3}{16}$") x 4½"x 2½"	36"	45"	16
48- 57 CIRCLE	(9"-7$\frac{19}{32}$") x 4½"x 2½"	48"	57"	20
60- 69 CIRCLE	(9"-7$\frac{13}{16}$") x 4½"x 2½"	60"	69"	24
72- 81 CIRCLE	(9"-8") x 4½"x 2½"	72"	81"	29
84- 93 CIRCLE	(9"-8⅛") x 4½"x 2½"	84"	93"	33
96-105 CIRCLE	(9"-8$\frac{7}{32}$") x 4½"x 2½"	96"	105"	37
108-117 CIRCLE	(9"-8$\frac{5}{16}$") x 4½"x 2½"	108"	117"	41
120-129 CIRCLE	(9"-8⅜") x 4½"x 2½"	120"	129"	45

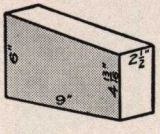
STANDARD 9" x 6" SERIES SHAPES



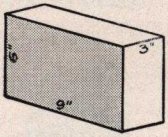
Straight
(also Flat Back Straight)
9"x 6"x 2½"



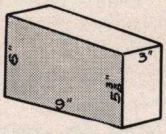
9"x 6"x 2½" No. 1 Key
9"x (6"-5⅜") x 2½"



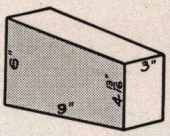
9"x 6"x 2½" No. 2 Key
9"x (6"-4 13/16") x 2½"



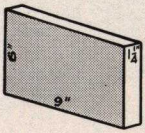
Straight
9"x 6"x 3"



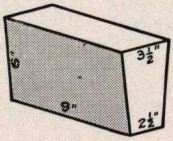
9"x 6"x 3" No. 1 Key
9"x (6"-5⅜") x 3"



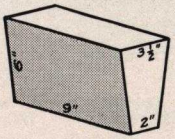
9"x 6"x 3" No. 2 Key
9"x (6"-4 13/16") x 3"



Flat Back Split
9"x 6"x 1¼"

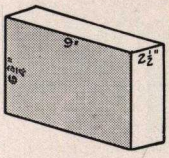


No. 1 Flat Back Arch
9"x 6"x (3½"-2½")

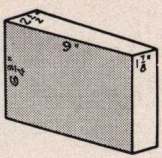


No. 2 Flat Back Arch
9"x 6"x (3½"-2")

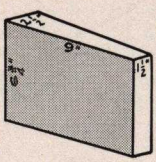
STANDARD 9" x 6¾" SERIES SHAPES



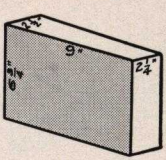
Large 9" Straight
(2½" Series)
9"x 6¾"x 2½"



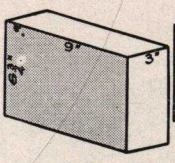
Large 9" No. 1 Wedge
(2½" Series)
9"x 6¾"x
(2½"-1⅞")



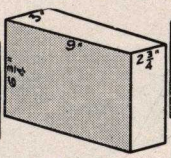
Large 9" No. 2 Wedge
(2½" Series)
9"x 6¾"x
(2½"-1½")



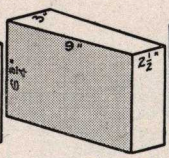
Large 9" No.1-X Wedge
(2½" Series)
9"x 6¾"x
(2½"-2¼")



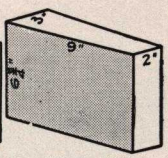
Large 9" Straight
(3" Series)
9"x 6¾"x 3"



Large 9" No. 1 Wedge
(3" Series)
9"x 6¾"x
(3"-2¾")

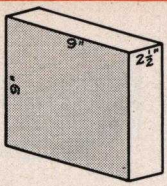


Large 9" No. 2 Wedge
(3" Series)
9"x 6¾"x
(3"-2½")

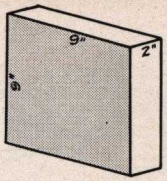


Large 9" No. 3 Wedge
9"x 6¾"x (3"-2")

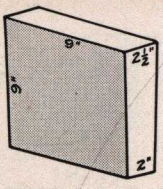
STANDARD 9" x 9" SERIES SHAPES



Straight
9"x 9"x 2½"
(also 9"x 9"x 3")

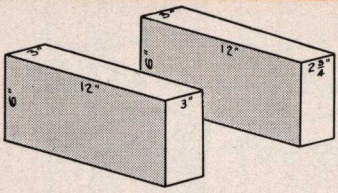


Split Brick
9"x 9"x 2"
(also 9"x 9"x 1¼")



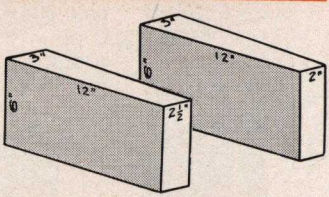
Arch
9"x 9"x (2½"-2")
(also 9"x 9"x (3"-2½")

STANDARD 12"x 6"x 3" SERIES SHAPES



Straight
12"x 6"x 3"

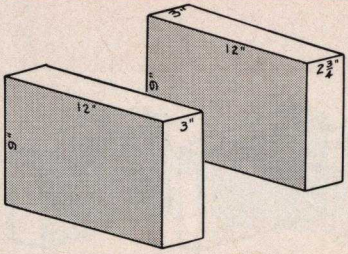
No. 1 Wedge
12"x 6"x (3"-2¾")



No. 2 Wedge
12"x 6"x (3"-2½")

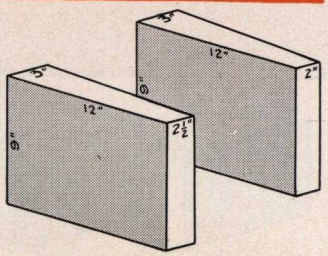
No. 3 Wedge
12"x 6"x (3"-2")

STANDARD 12"x 9"x 3" SERIES SHAPES



Straight
12"x 9"x 3"

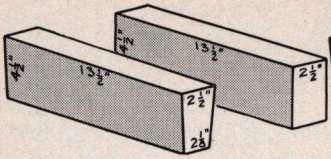
No. 1 Wedge
12"x 9"x (3"-2¾")



No. 2 Wedge
12"x 9"x (3"-2½")

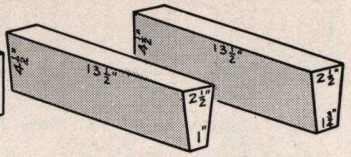
No. 3 Wedge
12"x 6"x (3"-2")

STANDARD 13½" x 4½" x 2½" SERIES SHAPES



Straight
13½"x 4¼"x 2½"

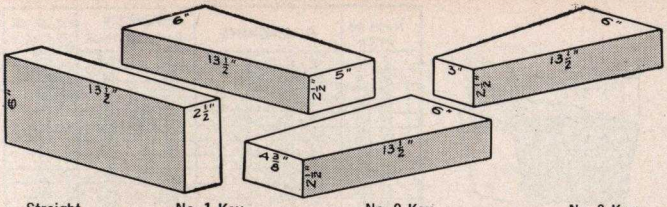
No. 1 Arch
13½"x 4½"x
(2½"-2⅛")



No. 2 Arch
13½"x 4½"x
(2½"-1¾")

No. 3 Arch
13½"x 4½"x
(2½"-1")

STANDARD 13½" x 6" x 2½" SERIES SHAPES



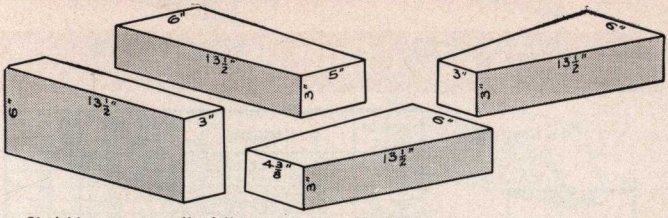
Straight
13"x 6"x 2½"

No. 1 Key
13½"x (6"-5")x 2½"

No. 2 Key
13½"x (6"-4⅜")x 2½"

No. 3 Key
13½"x (6"-3")x 2½"

STANDARD 13½" x 6" x 3" SERIES SHAPES

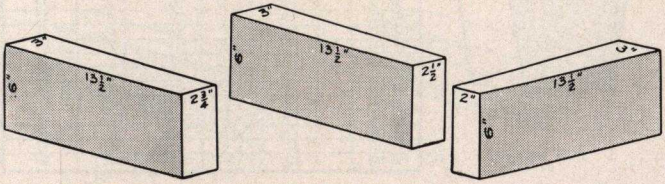


Straight
13½"x 6"x 3"

No. 1 Key
13½"x (6"-5") x 3"

No. 2 Key
13½"x (6"-4⅜") x 3"

No. 3 Key
13½"x (6"-3") x 3"

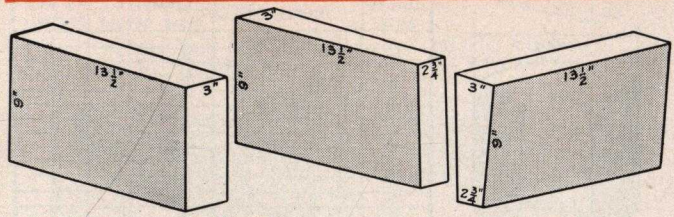


No. 1 Wedge
13½"x 6"x (3"-2¾")

No. 2 Wedge
13½"x 6"x (3"-2½")

No. 3 Wedge
13½"x 6"x (3"-2")

STANDARD 13½" x 9" x 3" SERIES SHAPES

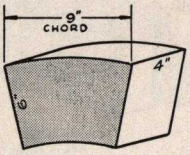


Straight
13½"x 9"x 3"

No. 1 Wedge
13½"x 9"x (3"-2¾")
also No. 2 Wedge–13½"x 9"x (3"-2½")
also No. 3 Wedge–13½"x 9"x (3"-2")

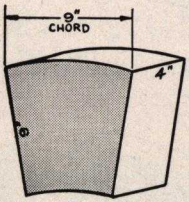
No. 1 Arch
13½"x 9"x (3"-2¾")
also No. 2 Arch–13½"x 9"x (3"-2½")
also No. 3 Arch–13½"x 9"x (3"-2")

9" x 6" x 4" ROTARY KILN AND CUPOLA BLOCKS



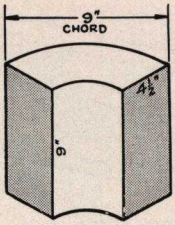
NAME OF BRICK	DIMENSIONS	DIAMETER INSIDE	DIAMETER OUTSIDE	NO. BRICK TO CIRCLE
30 - 42	(9"- 6 7/16") x 6" x 4"	30"	42"	15
36 - 48	(9"- 6 3/4") x 6" x 4"	36"	48"	17
42 - 54	(9"- 7") x 6" x 4"	42"	54"	19
48 - 60	(9"- 7 1/16") x 6" x 4"	48"	60"	21
54 - 66	(9"- 7 3/8") x 6" x 4"	54"	66"	23
60 - 72	(9"- 7 1/2") x 6" x 4"	60"	72"	26
66 - 78	(9"- 7 5/8") x 6" x 4"	66"	78"	28
72 - 84	(9"- 7 23/32") x 6" x 4"	72"	84"	30
78 - 90	(9"- 7 13/16") x 6" x 4"	78"	90"	32
84 - 96	(9"- 7 7/8") x 6" x 4"	84"	96"	34
90-102	(9"- 7 15/16") x 6" x 4"	90"	102"	36
96-108	(9"- 8") x 6" x 4"	96"	108"	38
102-114	(9"- 8 1/16") x 6" x 4"	102"	114"	40
108-120	(9"- 8 5/32") x 6" x 4"	108"	120"	42
114-126	(9"- 8 5/32") x 6" x 4"	114"	126"	44
120-132	(9"- 8 7/16") x 6" x 4"	120"	132"	46
123-135	(9"- 8 1/16") x 6" x 4"	123"	135"	48

9" x 9" x 4" ROTARY KILN BLOCKS



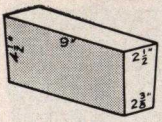
NAME OF BRICK	DIMENSIONS	DIAMETER INSIDE	DIAMETER OUTSIDE	NO. BRICK TO CIRCLE
48 - 66	(9"- 6 17/32") x 9" x 4"	48"	66"	23
54 - 72	(9"- 6 3/4") x 9" x 4"	54"	72"	26
60 - 78	(9"- 6 15/16") x 9" x 4"	60"	78"	28
66 - 84	(9"- 7 1/16") x 9" x 4"	66"	84"	30
72 - 90	(9"- 7 3/16") x 9" x 4"	72"	90"	32
78 - 96	(9"- 7 5/16") x 9" x 4"	78"	96"	34
84-102	(9"- 7 13/32") x 9" x 4"	84"	102"	36
90-108	(9"- 7 1/2") x 9" x 4"	90"	108"	38
96-114	(9"- 7 15/32") x 9" x 4"	96"	114"	40
102-120	(9"- 7 31/32") x 9" x 4"	102"	120"	42
108-126	(9"- 7 23/32") x 9" x 4"	108"	126"	44
114-132	(9"- 7 25/32") x 9" x 4"	114"	132"	46
117-135	(9"- 7 13/16") x 9" x 4"	117"	135"	48
120-138	(9"- 7 13/16") x 9" x 4"	120"	138"	49
123-141	(9"- 7 27/32") x 9" x 4"	123"	141"	50
126-144	(9"- 7 7/8") x 9" x 4"	126"	144"	51
132-150	(9"- 7 29/32") x 9" x 4"	132"	150"	53
138-156	(9"- 7 31/32") x 9" x 4"	138"	156"	55
144-162	(9"- 8") x 9" x 4"	144"	162"	57
150-168	(9"- 8 1/32") x 9" x 4"	150"	168"	59

9" x 9" x 4½" CUPOLA BLOCKS

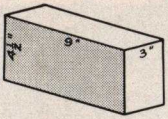


NAME OF BRICK	DIMENSIONS	DIAMETER INSIDE	DIAMETER OUTSIDE	NO. BRICK TO-CIRCLE
A	(9"- 5 3/4") x 9" x 4½"	16"	25"	9
1A	(9"- 6") x 9" x 4½"	18"	27"	9
B	(9"- 6 5/16") x 9" x 4½"	21"	30"	11
2B	(9"- 6 17/32") x 9" x 4½"	24"	33"	12
C	(9"- 6 3/4") x 9" x 4½"	27"	36"	13
D	(9"- 6 15/16") x 9" x 4½"	30"	39"	14
2D	(9"- 7 1/16") x 9" x 4½"	33"	42"	15
3D	(9"- 7 3/16") x 9" x 4½"	36"	45"	16
E	(9"- 7 11/32") x 9" x 4½"	40"	49"	18
AE	(9"- 7 13/32") x 9" x 4½"	42"	51"	18
BE	(9"- 7 7/16") x 9" x 4½"	43"	52"	18
CE	(9"- 7 5/8") x 9" x 4½"	47"	56"	20
2E	(9"- 7 19/32") x 9" x 4½"	48"	57"	20
F	(9"- 7 21/32") x 9" x 4½"	51"	60"	21
2F	(9"- 7 3/4") x 9" x 4½"	56"	65"	23
G	(9"- 7 13/16") x 9" x 4½"	60"	69"	24
H	(9"- 8") x 9" x 4½"	73"	82"	29

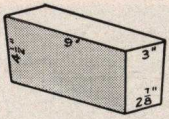
MALLEABLE FURNACE BUNG BRICK



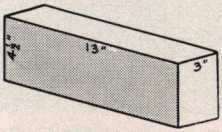
9" Arch Bung
9"x 4½"x (2½"-2⅜")



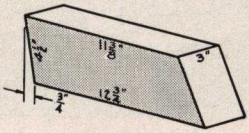
101-9" Square Bung
9"x 4½"x 3"



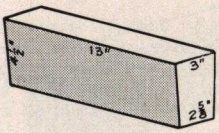
105-9" Arch Bung
9"x 4½"x (3"-2⅞")



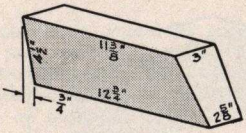
101-13" Square Bung
13"x 4½"x 3"



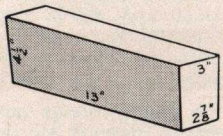
102-13" Angle Bung
(12¾"-11⅜") x 4½"x 3"



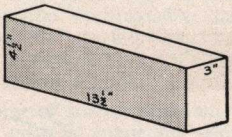
103-13" Arch Bung
13"x 4½"x (3"-2⅜")



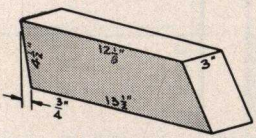
104-13" Arch Angle Bung
(12¾"-11⅜") x 4½"x (3"-2⅜")



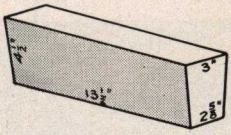
105-13" Arch Bung
13"x 4½"x (3"-2⅞")



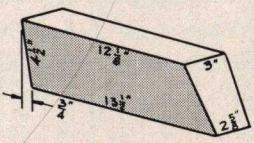
101-13½" Square Bung
13½"x 4½"x 3"



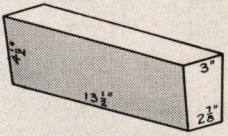
102-13½" Angle Bung
(13½"-12⅛") x 4½" x 3"



103-13½" Arch Bung
13½"x 4½"x (3"-2⅜")

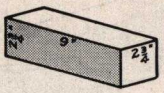


104-13½" Arch Angle Bung
(13½"-12⅛") x 4½"x (3"-2⅜")

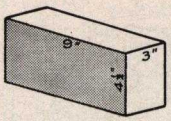


105-13½" Arch Bung
13½"x 4½"x (3"-2⅞")

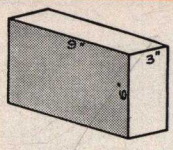
OPEN HEARTH CHECKERS



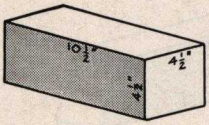
9"x 2¾"x 2¾"



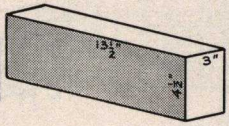
9"x 4½"x 3"



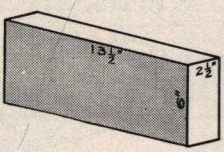
9"x 6"x 3"



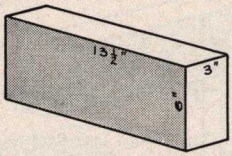
10½"x 4½"x 4½"
(also 10½"x 4½"x 3")



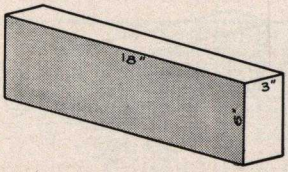
13½"x 4½"x 3"



13½"x 6"x 2½"

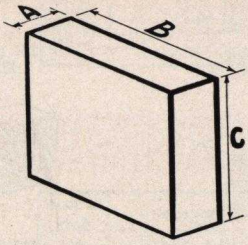


13½"x 6"x 3"



18"x 6"x 3"

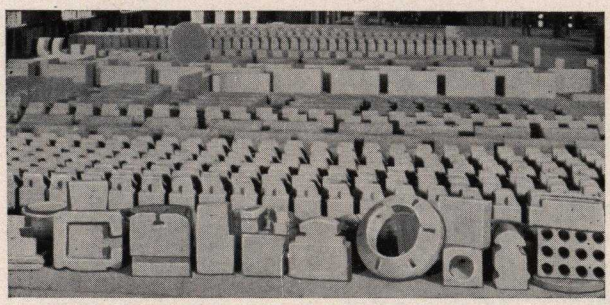
SQUARE EDGE SHAPES



The following sizes of square edge tile are always in stock. Dimensions given are in inches. Weights are approximate.

A	B	C	Wt.	A	B	C	Wt.	A	B	C	Wt.
1½	12	12	15.9	2½	12	18	42.2	3	12	30	79.9
2	12	12	21.5	2½	12	24	54.5	3	12	36	96.8
2	12	15	26.8	3	6	12	17.7	4	12	12	43.3
2	12	18	31.7	3	6	18	26.5	4	12	15	61.2
2	12	24	42.4	3	12	12	33.0	4	12	18	66.0
2½	9	18	29.8	3	12	15	40.2	4	12	24	81.0
2½	12	12	27.5	3	12	18	47.8	4	12	30	109.6
2½	12	15	32.8	3	12	24	60.4	4	12	36	136.5

SPECIAL SHAPES



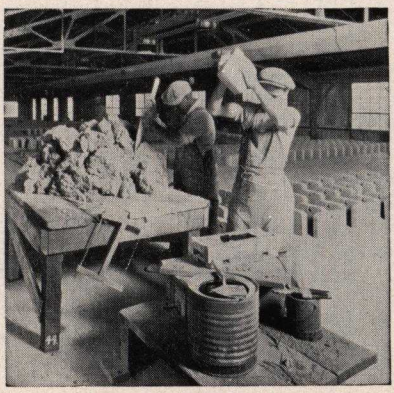
A Few Difficult Shapes, and view showing Special Shapes drying on a section of the Hot Floor.

● Wherever furnace design and operating conditions permit, the use of the standard brick shapes is recommended because they are less expensive and can be shipped promptly from stock. When conditions make the use of special shapes necessary or preferable they should be made as simple in design as possible.

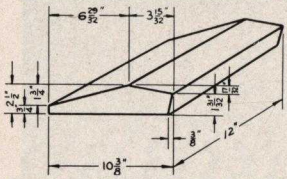
Mexico Refractories Company has splendid facilities for producing special shapes, both of fire clay and high alumina materials, and specialize in their manufacture. The skill and wide experience of the men in this department insures the fine workmanship and high quality, for which "BETTER REFRACTORIES", in the form of special shapes, are noted. Simple or difficult in design, they will be true to size and of the proper materials to give long service.

Many special shapes are in our stocks for prompt shipment, including all the standard square edge tile, the most commonly used tube, baffle, and arch tile and others.

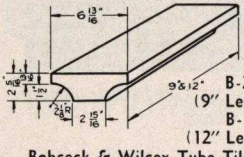
Skilled laborers in the Hand Molding department assure you of uniformly made special tile, with square edges, true cut-outs, and even texture.



SPECIAL SHAPES

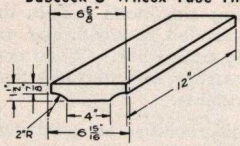


Babcock & Wilcox Special Brick 0

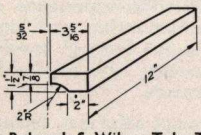


9" & 12" B-25390 (9" Length) B-11430 (12" Length)

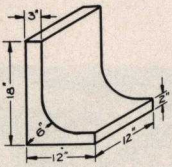
Babcock & Wilcox Tube Tile



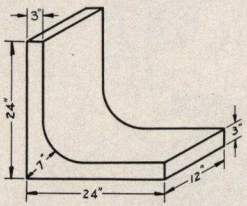
Babcock & Wilcox Tube Tile 4T



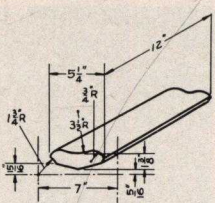
Babcock & Wilcox Tube Tile ½4T



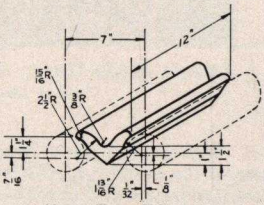
Babcock & Wilcox Angle Tile 14661



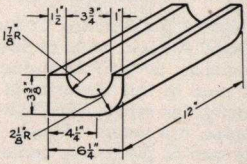
Babcock & Wilcox Angle Tile 14662



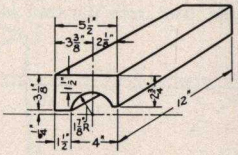
Heine Tube Tile A



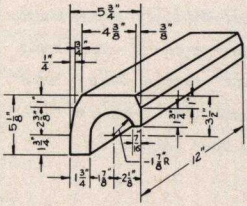
Heine Tube Tile B



Heine Tube Tile C

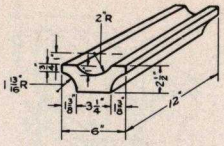


Heine Tube Tile New L

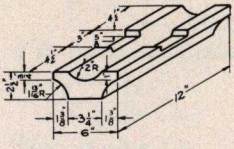


Heine Tube Tile Special L

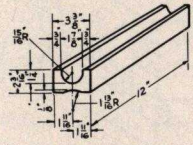
SPECIAL SHAPES



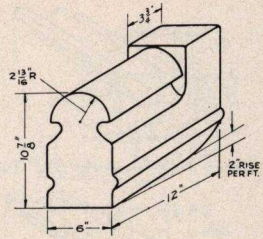
Heine Tube Tile T



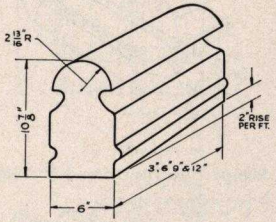
Heine Tube Tile TX



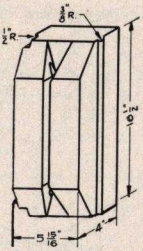
Heine Tube Tile U



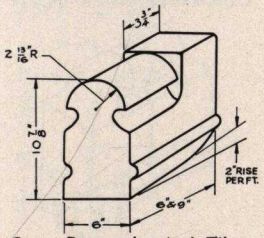
Green Engineering Arch Tile
L-12-R (12" Length)



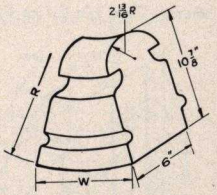
Green Engineering Arch Tile
L-3 (3" Length)
L-6 (6" Length)
L-9 (9" Length)
L-12 (12" Length)



Green Engineering Gate Tile 3155
(with reversible ends)



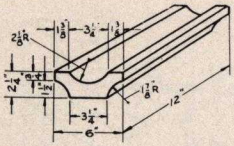
Green Engineering Arch Tile
L-6-R (6" Length)
L-9-R (9" Length)



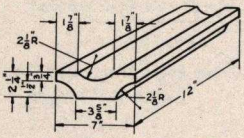
Green Engineering Arch Tile
R-30 and RT-30

TILE NO.	R	W
R-30	18½	8⅜
RT-30	17⅜	8 11/16

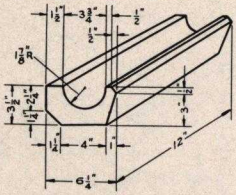
SPECIAL SHAPES



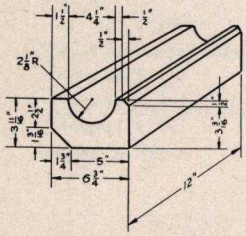
Murray Tube Tile A (for 3½" Tubes)



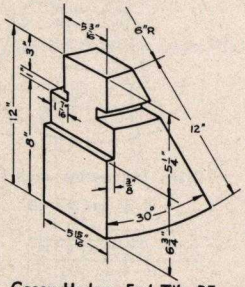
Murray Tube Tile A (for 4" Tubes)



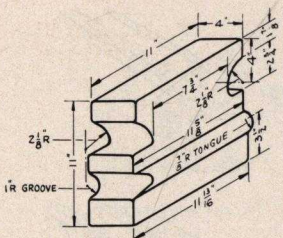
Murray Tube Tile C (for 3½" Tubes)



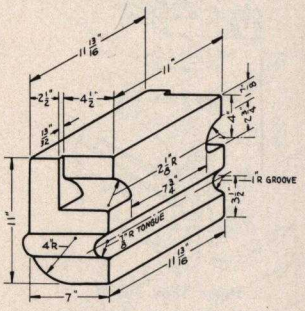
Murray Tube Tile C (for 4" Tubes)



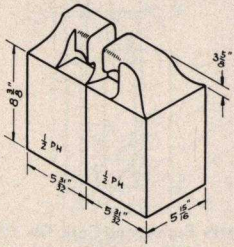
Casey-Hedges End Tile PE



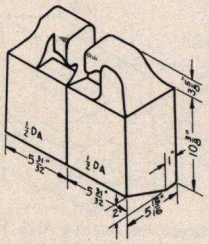
Casey-Hedges Hanger Tile D



Casey-Hedges End Tile D

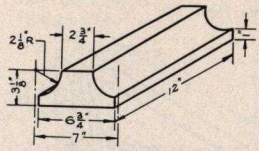


Casey-Hedges Hanger Tile ½PH

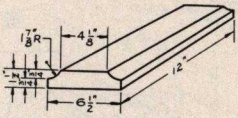


Casey-Hedges Hanger Tile ½DA

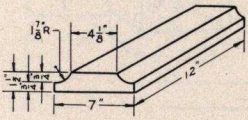
SPECIAL SHAPES



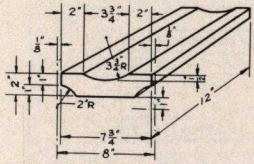
Walsh & Weidner Tube Tile 6410
(for 4" Tubes)



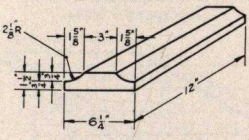
O'Brien Tube Tile 1-11



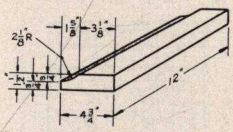
O'Brien Tube Tile 1-13



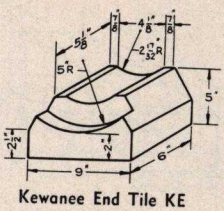
O'Brien Tube Tile 1-10



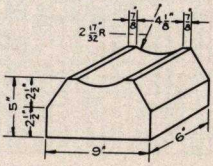
Erie City Tube Tile M



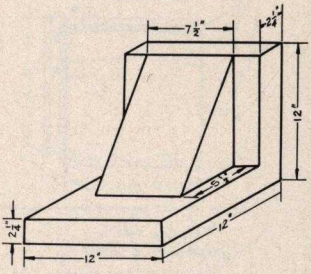
Erie City Tube Tile O



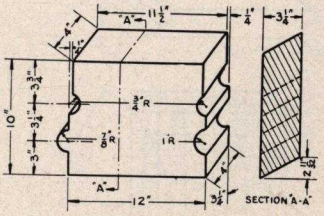
Kewanee End Tile KE



Kewanee Tube Tile H

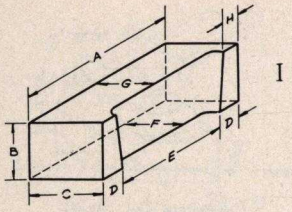


Quinn End Angle Tile



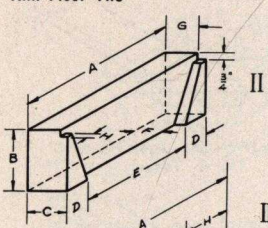
Quinn Hanger Tile

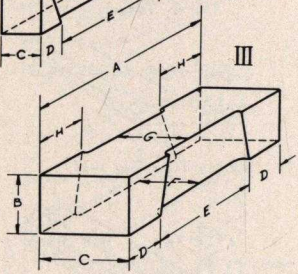
SPECIAL SHAPES



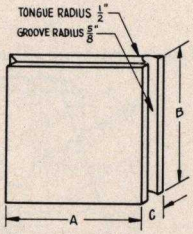
I

Kiln Floor Tile





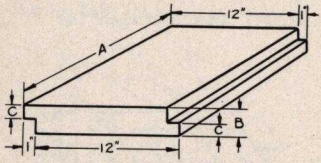
KILN FLOOR TILE									
TYPE	NO.	A	B	C	D	E	F	G	H
I	1	12	4½	4½	2	8	3⅝	3⅛	1
I	2	14	4½	4½	1⅜	10½	4	3¼	¾
I	3	12	5½	3	1½	9	2¼	2½	½
II	4	14	5½	3½	2	10	2½	3	½
II	5	12	5	4	1⅜	9¼	3⅛	3⅜	½
I	6	13½	5	3¾	2½	8½	2⅜	2½	¾
I	7	14	5	6½	2	10	5¼	4¼	1½
I	8	18	5	6½	2	14	5½	5	1½
III	9	18	5¾	8	3½	11	6¼	6½	4
III	10	22	6	8	4	14	6¼	6¾	4½



Tongue & Groove Tile

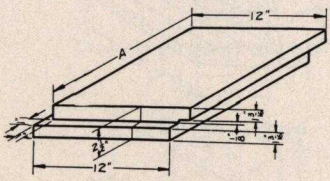
TONGUE AND GROOVE TILE-4 SIDES			
SIZE	A	B	C
2×12×12	12	12	2
2×12×15	12	15	2
2×12×18	12	18	2

Flange Tile (Shiplapped 2 Sides)



FLANGE TILE-2 SIDES			
SIZE	A	B	C
2½×12×18	18	2½	1 3/16
2½×12×24	24	2½	1 3/16
3×12×24	24	3	1 7/16
3×12×30	30	3	1 7/16

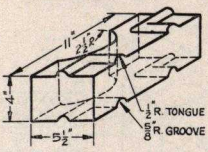
Flange Tile (Shiplapped 4 Sides)

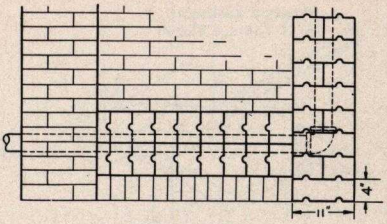


FLANGE TILE-4 SIDES	
SIZE	A
2½×12×12	12
2½×12×15	15
2½×12×18	18
2½×12×24	24

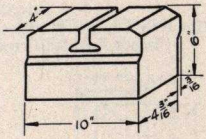
SPECIAL SHAPES

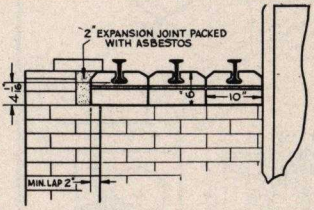
Blow-Off Pipe Protector Tile





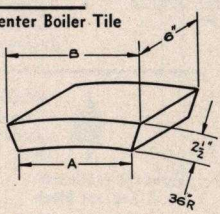
A-1 Rear Arch Tile





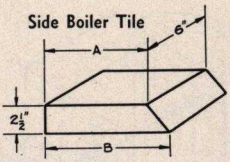
Center Boiler Tile

CENTER BOILER TUBE									
NO.	6×9	6×10	6×12	6×13	6×14	6×15	6×16	6×18	6×24
A	9	10	12	13	14	15	16	18	24
B	11	12	14	15	16	17	18	20	26



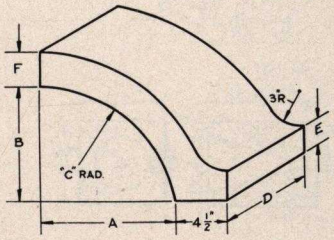
Side Boiler Tile

SIDE BOILER TILE									
NO.	6×9	6×10	6×12	6×13	6×14	6×15	6×16	6×18	6×24
A	9	10	12	13	14	15	16	18	24
B	11	12	14	15	16	17	18	20	26



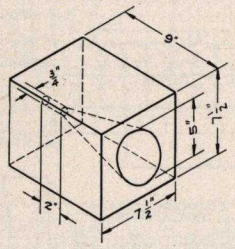
Back Boiler Tile

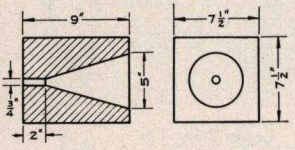
BACK BOILER TILE						
SIZE	A	B	C	D	E	F
12×21×8	12	10	12¼	8	2½	3
14×23×8	14	10 11/16	14½	8	2½	3
16×25×8	16	11 5/16	16¾	8	2½	3
18×27×8	18	12	18¾	8	2½	3
18×27×9	18	12	18 3/8	9	2½	3
20×29½×9	20	13½	21½	9	2½	3
24×34½×9	24	16	26	9	2½	3
28×39½×9	28	19½	30	9	2½	3
30×44 1/16×8	30	24	30 3/8	8	3½	3½
36×53×9	36	30	37	9	3¾	3¾



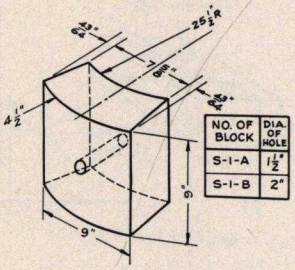
SPECIAL SHAPES

Standard Malleable No. 1 Tap-out Block



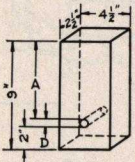


Slag Hole Block



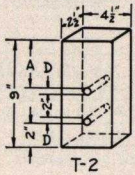
NO. OF BLOCK	DIA. OF HOLE
S-1-A	1 1/2"
S-1-B	2"

One Hole Tap-out Block (Breast Brick)



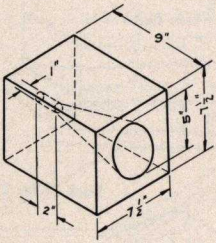
T-1

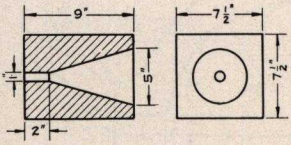
Two Hole Tap-out Block (Breast Brick)



T-2

Standard Malleable No. 2 Tap-out Block

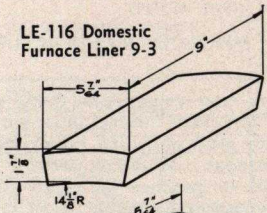




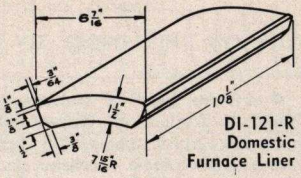
NO. OF BLOCK	A	D
T-1-A	6 1/2	1/2
T-1-B	6 1/4	3/4
T-1-C	6	1
T-1-D	5 3/4	1 1/4
T-1-E	5 1/2	1 1/2
T-2-A	4	1/2
T-2-B	3 1/2	3/4
T-2-C	3	1
T-2-D	2 1/2	1 1/4
T-2-E	2	1 1/2

SPECIAL SHAPES

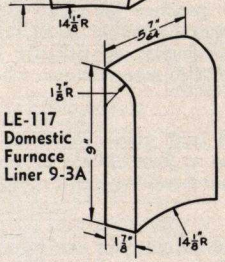
LE-116 Domestic Furnace Liner 9-3

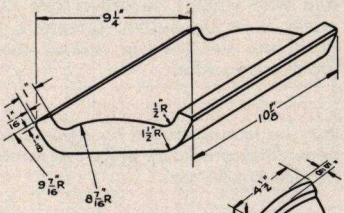


DI-121-R Domestic Furnace Liner



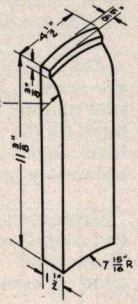
LE-117 Domestic Furnace Liner 9-3A



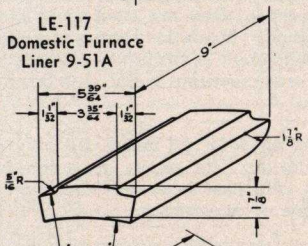


DI-122-R Domestic Furnace Liner

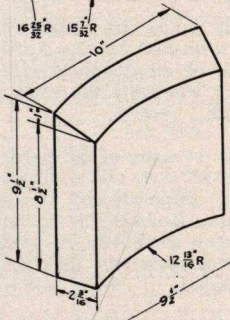
KO-107 Domestic Furnace Liner



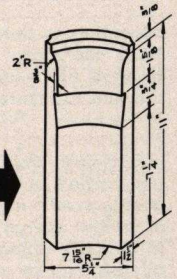
LE-117 Domestic Furnace Liner 9-51A



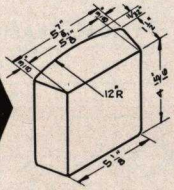
CA-143 Domestic Furnace Liner X



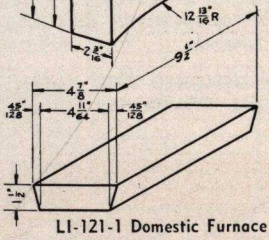
KO-100-1 Domestic Furnace Liner



LI-120 Domestic Furnace Liner



LI-121-1 Domestic Furnace Liner E



PATENTED ARCH AND WALL SHAPES

Specify on the face of your order:

"TILE ON THIS ORDER TO BE OF MEX-R-CO MANUFACTURE"

● In the field of furnace designers and contractors there are several organizations known as "Arch and Wall" companies, which have developed special tile designed for wall and arch construction possessing various features and advantages. Manufacturers of refractories materials are only permitted to produce patented arch and wall shapes on order from the respective Arch and Wall company; it is imperative, therefore, that the consumer specifically request the designer to furnish tile of Mex-R-Co manufacture when placing an order.

MOLDS ARE PRECISELY MADE—Patented arch and wall shapes may be manufactured by either the Dry Press or Hand Made process, depending primarily upon the established specifications and expected service conditions.

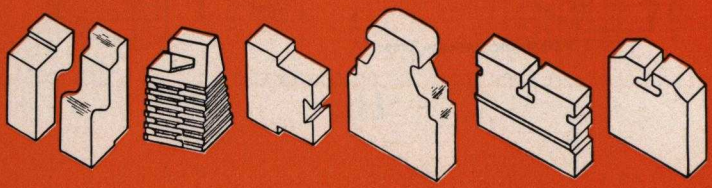
The heavy wood molds in which Hand Made shapes are formed are sturdily built and of rigid construction; they are steel lined to insure uniform accuracy of size and shape. Molds for shapes manufactured by the Dry Press process are machined to calibrated dimensions from a specially alloyed, tough and wear-resistant metal, that assures accurately sized shapes at all times.

Upon completion of manufacture of an order all molds are indexed and stored in the Mex-R-Co mold "library" for re-use on a reorder. "New mold" costs are thus avoided, and time is saved—time that is often so essential, especially in cases of emergency.

PER BLUEPRINT SPECIFICATIONS—All molds are made strictly according to the blueprint specifications furnished by the Arch and Wall company. An exacting final check of all dimensions of the finished tile is made against the blueprint when the tile come from the kiln to insure uniform fitting on the job.

CARRIED IN STOCK—Fairly large stocks of many of the more commonly used and frequently ordered patented arch and wall shapes are carried in stock. This enables prompt shipment and frequently avoids costly shutdown periods for repair. Besides the advantage of freight saving patented shapes, carried in stock, can be included in carload shipments with other refractories materials, thus placing all refractories on the job for use as needed.

TYPICAL EXAMPLES OF SPECIAL TILE DESIGNED AND PATENTED BY A FEW ARCH AND WALL COMPANIES.

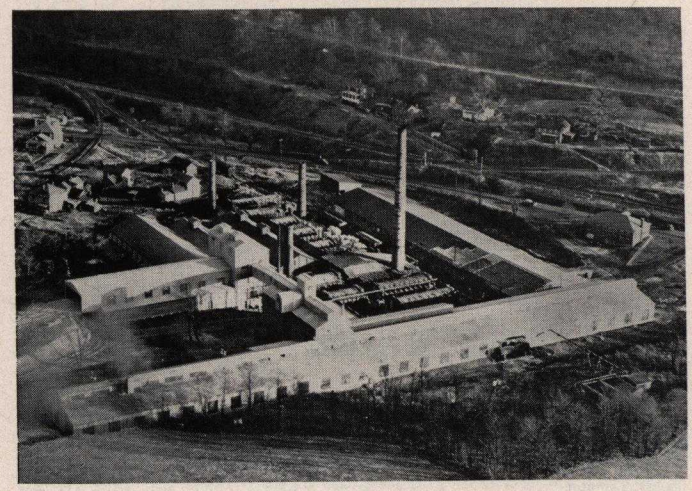


COMPOSITE TABLE OF TYPICAL APPLICATIONS*

TYPE OF INDUSTRIAL FURNACE	JAY BEE FINE	JAY BEE COARSE	JAY BEE MAXIMUL	MO-REX	AZTEX	VIKING	THOR	BIG SAVAGE SUPER	BIG SAVAGE	VAN DYKE	ALUMEX-50	ALUMEX-60	ALUMEX-70	M-26
Air Furnace Roofs		★						★	★					
Aluminum Melting Furnaces	★		★	★					★					
Annealing Furnaces				★		★	★		★					★
Baking Ovens				★		★			★					★
Billet Heating Furnaces	★	★	★	★		★		★	★					
Blast Furnace Stoves	★			★				★	★					
Boilers –Heavy-Duty	★	★	★		★			★				★		
Boilers—Moderate-duty: Hand-fired				★	★	★	★		★					
Stoker-fired			★	★	★				★					
Oil-fired		★		★	★			★	★					
Gas-fired				★					★					★
Brass Melting Furnaces			★		★									
Brazing Furnaces														★
Carburizing Furnaces				★					★					★
Carbonizing Furnaces				★					★					★
Ceramic Kilns	★	★	★	★	★	★		★	★	★	★	★		★
Checker Chambers	★			★		★	★	★	★					★
Coke Ovens				★					★	★				
Copper Smelting & Refining					★	★			★	★		★	★	
Crucible Melting Furnaces	★	★	★		★			★						
Cupolas			★		★		★		★					
Electric Furnaces	★	★						★		★				
Enameling Furnaces		★		★					★			★		★
Forging Furnaces	★	★	★	★	★			★	★					
Frit Smelters	★		★		★									
Gas Generators	★			★	★			★	★					
Gas Retorts				★					★	★				
Glass Furnaces—Roofs										★				
Ports	★		★					★				★		
Glass Lehrs						★								★
Glass Tank Checkers	★		★	★	★			★	★					
Gypsum Pots		★						★						
Heat Treating Furnaces		★	★	★	★	★	★	★	★					★
Incinerators	★			★	★	★			★					
Iron Blast Furnaces			★											
Ladles	★		★			★	★							
Lead Softening Furnaces					★									
Magnesium Melting Furnaces	★	★		★	★			★	★					
Malleable Furnaces—Roofs		★						★	★					
Bottoms	★		★						★					
Side Walls	★		★		★				★					
Nitriding Furnaces						★			★					★
Normalizing Furnaces						★			★					★
Oil Refining Heaters	★	★		★	★			★	★			★		★
Open Hearth Checkers	★		★	★	★		★	★	★					
Open Hearth Furnaces										★				
Portable Asphalt Heaters		★						★				★		
Reheating Furnaces	★	★		★				★	★					
Lead Dross Reverberatory Furnaces			★		★								★	
Rotary Kilns—Cement					★			★	★		★	★	★	
Lime			★		★				★				★	
Roasters	★		★		★			★	★		★			
Skelp Furnaces	★							★						
Soaking Pits	★	★	★	★	★			★	★					
Steel Holding Furnaces			★		★									
Steel Mills (General Mill Use)				★	★				★					
Stress Relieving Furnaces						★			★					★
Tempering Furnaces														★
Tunnel Kilns	★	★	★	★	★	★		★	★	★		★		★

(*) In instances where a number of brands are indicated for a definite application selection of the proper refractory for a specific service is determined by the particular operating conditions to be met.

NATIONAL REFRACTORIES COMPANY



Aerial view of Big Savage Refractories Corporataion Plant at Frostburg, Maryland.

● National Refractories Company was organized in 1935 to market and distribute the "Better Refractories" line of Mexico Refractories Company, Mexico, Missouri throughout the vast industrial Eastern United States.

The first step in the long range expansion program was effected in 1938 with the acquisition of the BIG SAVAGE Refractories Corporation firebrick plant at Frostburg, Maryland. At the same time the purchase of the silica brick plant at Van Dyke, Pennsylvania was consumated.

World War II laid extreme demands on the production facilities of both the BIG SAVAGE and VAN DYKE plants, and the ready acceptance of National Refractories Company products during the hectic war time necessitated the expansion of plant-wide facilities in the immediate post war years. Construction of buildings and installation of modern equipment at Frostburg was completed in 1949 and today two of the most modern type tunnel kilns and a battery of six dry presses are in daily operation.

Located in the rich clay section of the Savage Mountain range of western Maryland, the Frostburg plant obtains raw materials from an abundant source of underground veins and open pit mining. Maryland fire clays are noted for their high qualities of refractoriness and purity, and enjoy the reputation of producing some of the finest fireclay brick manufactured in the United States

The fireclay is transported from the mine by cable car and by truck from the open pit mine to spacious plant storage facilities. Each phase of manufacture—from mining through grinding, screening, pressing, setting and burning—is carefully and continuously supervised in every operation.

● The Van Dyke plant, one of the last silica plants to be built in the East, is of excellent modern construction. The products of this plant are widely used in roofs of basic open-hearth and electric steel furnaces, and for complete linings in acid furnaces, whether electric or open-hearth.

Hence, the production facilities of three modern manufacturing plants—the Frostburg, Maryland plant with its nationally known brand of "BIG SAVAGE" products; the Van Dyke, Pennsylanvia plant producing high grade Pennsylvania "VAN DYKE" silica brick; and the modern production facilities of Mexico Refractories Company, Mexico, Missouri, where "BETTER REFRACTORIES" products are manufactured—permit National Refractories Company to offer an unusually complete line of high alumina brick, fireclay brick, silica brick and refractory specialty products in the Industrial East.

●

PALLETIZING OF REFRACTORIES

● Pallet loading service is available to refractory users of BIG SAVAGE fireclay brick and VAN DYKE silica brick, who are equipped with lift trucks to handle these refractories upon arrival of the freight cars or trucks.

Mechanized handling speeds up the storage of brick; the loading and unloading of freight cars; it cuts down possible abuse due to rough handling of brick whereby the service life is shortened and eliminates extra handling and additional labor expense.

The overall size of pallets (skids) are 36" x 48" with three 2" x 3" runners. The capacity of a pallet is approximately 480-9" equivalent.

Pallets in usable condition are returnable and credit will be allowed.

BIG SAVAGE

HIGH-DUTY FIREBRICK

FOR GENERAL BOILER AND FURNACE CONSTRUCTION

(Made by Dry Press Process—Tunnel Kiln Burned)

● BIG SAVAGE brand of firebrick with a PCE of 32-33 readily meet ASTM specifications for all types of high-duty, first quality fireclay brick. The high fusion quality of the flint and plastic clays used in their manufacture adapts them particularly for severe general boiler and furnace construction work.

BIG SAVAGE brick meet as wide a range of service conditions as any firebrick on the market today. They are being effectively and economically used with all types of fuel in boilers, steel mills, forging and heating furnaces, incinerators, oil refineries, lime and cement plants, chemical and glass plants, malleable iron plants and sugar mills.

Experience has proven BIG SAVAGE brick render long and satisfactory service, they give low cost service and freedom from constant repairs and shutdowns. The BIG SAVAGE plant management carefully supervises the various phases of manufacture and the scientifically controlled processing enables this refractory to withstand the increased severity of operation so frequently demanded in modern industrial power plants.

The unexcelled all-purpose performance of BIG SAVAGE brick is due primarily to inherent characteristics of the brick, which overcome the principal destructive elements of combustion with subsequent firebrick failure. These outstanding qualities are (1) high fusion or melting point, (2) high spalling resistance, (3) resistance to slag attack,

(4) freedom from volume shrinkage, (5) ability to withstand thermal shock and (6) load bearing structural strength.

BIG SAVAGE "ALL-PURPOSE"

TYPICAL APPLICATIONS FOR WHICH BIG SAVAGE "ALL PURPOSE" BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Air Furnaces	Sidewalls and Bottoms
Aluminum Melting Furnaces	Sidewalls and Bottoms
Annealing Furnaces	General Use
Bake Ovens	Tile Walls
Billet Heating Furnaces	Roofs; Sidewalls (Hot Zone)
Blooming Mill Furnaces	General Structure
Boilers (all kinds)	Walls, Arches, Stack Lining
Ceramic Kilns	General Use
Coke Ovens	General Brick Structure
Cupolas	Linings
Crucible Melting Furnaces	General Structure
Enamel Baking Furnaces	Sidewalls
Forge Furnaces	General Use
Frit Smelting Furnaces	General Use
Glass Tanks	Lower Checkers; Checker Chamber Walls
Heat Treating Furnaces	General Use
Incinerators	Furnace Walls; Roof and Flues
Oil Stills	General Use
Open Hearth Furnaces	Flues; Checkers; Checker Chamber Walls and Roof
Periodic Kilns	Walls and Roof
Rotary Kilns (cement-lime)	High Heat Zones
Soaking Pits	Walls and Covers
Skelp Furnaces	Bottoms
Steel Mills	General Purpose Brick
Stoves (Blast Furnace)	Linings
Tunnel Kilns	Walls and Roof

BIG SAVAGE COARSE

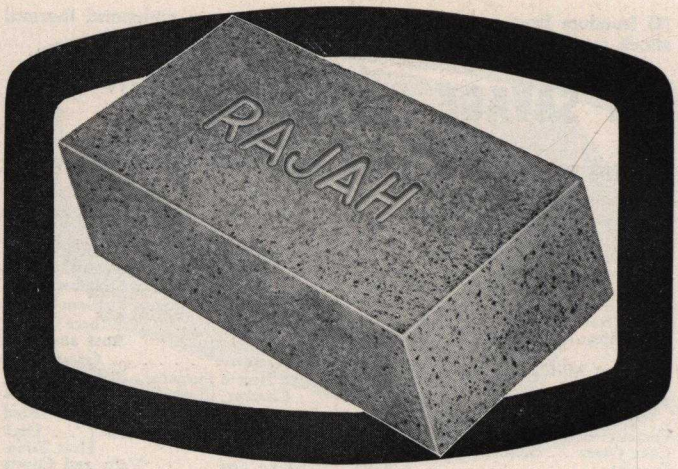
TYPICAL APPLICATIONS FOR WHICH "BIG SAVAGE COARSE" BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Air Furnaces	Roofs and Walls
Aluminum Melting Furnaces	Roofs
Billet Heating Furnaces	Arches, Walls and Roofs
Blooming Mill Furnaces	Arches, Walls and Roofs
Boilers (All Kinds)	Roofs and Sidewalls; Suspended Arches
Ceramic Kilns	Sidewalls; Burner Ports; Arches
Electric Steel Furnaces	Roofs; Above Slag Line in Shell
Enamel Baking Furnaces	Roofs and Sidewalls
Forge Furnaces	Front Walls; Roofs
Gas Plants	Supporting Arches and Checkers
Heat Treating Furnaces	Flues; Combustion Chambers
Malleable Iron Furnaces	Roofs
Oil Stills	Firing Chambers
Open Hearth Furnaces	Checkers; Checker Chamber Roofs and Walls
Soaking Pits	Covers
Stoves (Blast Furnace)	Combustion Chambers
Skelp Furnaces	Arches, Walls and Roofs

ARCH AND WALL TILE

National Refractories Co. manufactures patented arch tile for Arch and Wall Companies for use with all suspended arch and wall construction and our "BETTER REFRACTORIES" materials may be obtained by having the purchaser specify on the order—

"TILE ON THIS ORDER TO BE MANUFACTURED BY NATIONAL REFRACTORIES CO."



RAJAH

SUPER-DUTY FIREBRICK

SUPERIOR RESISTANCE TO DESTRUCTIVE SLAG ATTACK

(Made by Dry Press Process—Tunnel Kiln Burned)

● The RAJAH All-Purpose brick is designed for conditions where an all-round Super-Duty Firebrick is required. This brick has less porosity than the coarse grained brick and has a tight structure resistant to slag penetration — and at the same time has much better spalling resistance than high-duty firebrick. It is highly recommended for many stoker, powdered-coal and oil-fired boilers, and in various industrial and metallurgical furnaces where slag, load, shrinkage and spalling resistance are required, but where the non-spalling property is of less importance than the property of resistance to slag attack.

TYPICAL APPLICATIONS FOR WHICH "RAJAH" ALL-PURPOSE SUPER-DUTY BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
Aluminum Melting Furnace	Reverberatory Hearths; Floors
Billet Heating Furnaces	Roofs and Sidewalls (Hot Zone)
Blast Furnace Stoves	Top Checkers; Combustion Chambers
Blooming Mill Furnaces	General Structure
Boilers (Heavy Duty)	Flat Suspended Arches; Furnace Walls; Suspended Walls; Sprung Arches
Ceramic Kilns	Piers; General Construction
Crucible Melting Furnaces	General Structure
Forge Furnaces	Sidewalls
Gas Generators	Carburetor and Superheater; Checkers
Glass Furnaces	Checkers
Hot Metal Mixers	Linings
Incinerators	Furnace Roofs
Oil Stills	Firing Chambers
Open Hearth Furnaces	Checkers
Reheating Furnaces	General Structure
Rotary Kilns and Roasters	High Heat Zones

RAJAH COARSE

SUPER-DUTY FIREBRICK

SUPERIOR RESISTANCE TO SPALLING AND VITRIFICATION

● The RAJAH COARSE brick is primarily designed for conditions requiring exceptional resistance to spalling, shrinkage and vitrification. They give superior service in furnaces operating at high and rapidly changing temperatures. This type of brick is recommended for heavy duty boiler furnaces, suspended arches and walls, forging and many industrial furnaces. They may be used in oil, gas and stoker or powdered-coal fired furnaces where the essential requirements are excellent non-spalling, non-shrinking and load resistance properties, but where the resistance to thin penetrating slags is not too important.

TYPICAL APPLICATIONS FOR WHICH "RAJAH COARSE" SUPER-DUTY BRICK ARE RECOMMENDED

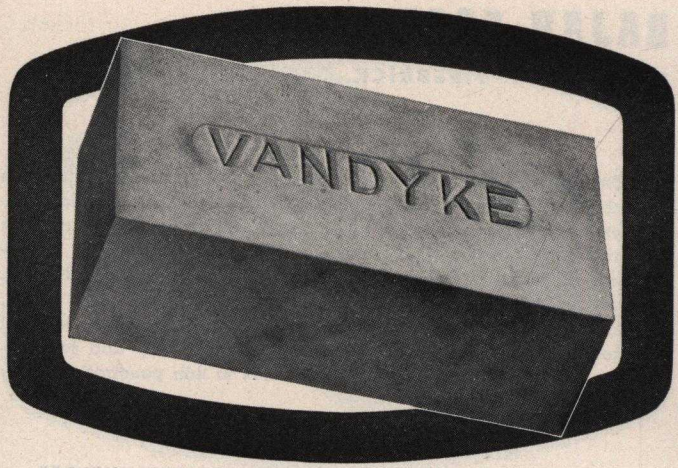
TYPE OF FURNACE	WHERE USED
Air Furnaces	Roofs
Billet Heating Furnaces	Walls and Roofs
Blast Furnace Stoves	Domes; Combustion Chamber Linings; Checkers
Boilers (Heavy Duty)	Walls, Suspended Arches
Ceramic Kilns	Side Walls; Burner Ports; Arches
Dryers	Oil-fired Furnace Linings
Electric Steel Furnaces	Roofs
Enameling Furnaces	Flues; Combustion Chambers; Piers
Forge Furnaces	Roofs; Sidewalls
Gas Plants	Supporting Arches for Checkers
Gypsum Pots	Flue Systems; Piers
Heat Treating Furnaces	Flues; Combustion Chambers
Magnesium Melting Furnaces	Sidewalls in Pot-type Furnace
Oil Stills	Firing Chambers
Open Hearth Furnaces	Checkers; Checker Chamber Roofs
Soaking Pits	Covers

BIG FOUR

INTERMEDIATE-DUTY FIREBRICK

BIG FOUR brick, known as intermediate or second quality brick, have a fusion point slightly lower than first quality brands. A good plastic clay is used in the manufacture of BIG FOUR and the same excellent workmanship as is incorporated in the BIG SAVAGE brand results in making this probably the superior brick of its class. They are manufactured by the dry press process and are tunnel kiln burned.

BIG FOUR fireclay brick are highly recommended as back-up brick for BIG SAVAGE and RAJAH Super-duty fireclay brick in large units where strength and tightness of linings are imperative and for use in many industrial furnaces where not too severe conditions are encountered.



VAN DYKE

SUPERIOR QUALITY SILICA FIREBRICK

● VAN DYKE silica brick are manufactured from quartzite or silica ganister deposits from the Tuscarora Mountain range of Pennsylvania. This ganister is found in the form of loose boulders, and also in solid ledge formations from which the floe stone has weathered away over the centuries.

The high grade raw materials used in VAN DYKE result in exceptionally low porosity, which is an important factor in giving the brick physical strength and resistance to penetration.

After passing through jaw and gyratory crushers, the quartzite rock is ground in large heavy-duty wet pans where a small amount of lime is thoroughly blended into the mix. The damp, tempered mix from the wet pans is then processed by either the Hand Molded or Dry Press method. The bricks are discharged onto steel pallets, placed in rack cars, dried in tunnel driers and then burned in round, periodic kilns.

Due to the volume change that takes place rapidly over a narrow range, the utmost in skill and care is employed throughout the high temperature process. Careful firing of VAN DYKE brick results in uniformity of burn, minimum warpage, and freedom from cracks, as well as a thorough crystalline conversion taking place in the brick structure.

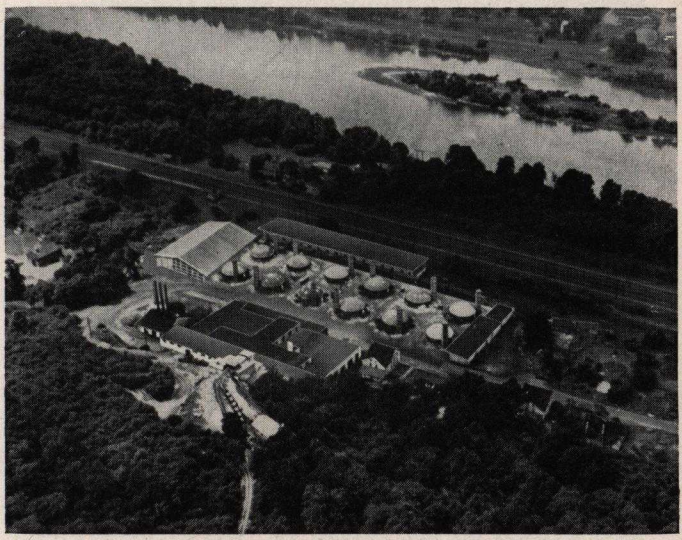
● The finished brick are tough, have high mechanical strength, exceptional resistance to abrasive action and unusual rigidity at high temperatures. VAN DYKE brick and special shapes are well bonded, of even texture, uniform in size and of excellent workmanship.

At the Van Dyke Plant the pallet system is used in both storage and carloading. Mechanized handling speeds up loading of freight cars, eliminates individual handling wherein brick are often abused and service life shortened, and facilitates the shipment of brick.

VAN DYKE silica brick are designed for and used primarily by the steel, copper, glass and lime industries—and are available in all standard sizes and series shapes.

TYPICAL APPLICATIONS FOR WHICH "VAN DYKE" SILICA BRICK ARE RECOMMENDED

TYPE OF FURNACE	WHERE USED
By-Product Coke Ovens	Ovens and Combustion Chambers
Coal Gas Benches	Retorts
Copper Anode Furnaces	Roof
Copper Reverberatory Furnaces	Sidewalls; Roof
Copper Smelting & Refining Furnaces	Roof
Electric Steel Furnaces	Roof; Sidewalls
Glass Tanks	Crowns; Breast Walls
Open Hearth Furnaces	Walls; Roof, Ports
Shaft Lime Kilns	Eyes; Certain Portion of Burning Zone
Silicate of Soda Furnaces	Roof
Soaking Pits	Walls; Arches
Tunnel Kilns	Roof
Wire Bar Furnaces	Roof
Zinc Oxide Furnaces	Side Bridge Walls, Roof



Aerial view of Van Dyke Silica Brick Plant at Van Dyke, Pennsylvania

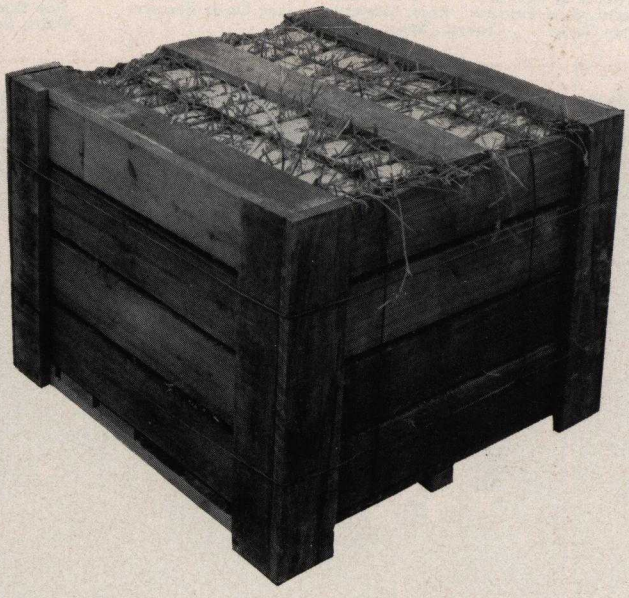
EXPORT DEPARTMENT

Due to the favorable location of our Refractory Plants, we have at our disposal exceptional facilities for making shipments abroad—by all-rail service to Canada, Cuba or Mexico, or by combined rail-and-water service to all other countries.

The extensive experience of our personnel in handling foreign shipments assures prompt and accurate execution of the numerous details required in the documentation, packing and routing of export shipments.

Extraordinary precautions are taken to safeguard all shipments against damage in transit. Skilled operators pack our materials for export; every shipment is carefully inspected before being loaded on the steamer.

Proper packing for ocean transportation, to assure arrival in the same perfect-workmanship condition as when the products left our factories, is an important phase of export shipping. The satisfactory condition in which our brick arrive at far-off destinations—with additional handling for trans-shipment often being necessary—is evidence of the painstaking attention we give this all-important operation.



View of open-top skid crate, containing 300 9x4½x2½" straights, carefully packed with straw. Weight of empty crate approximately 175 lbs.; displacement 30.6 cu. ft.; gross weight, packed, approximately 2450 lbs.

PACKAGING DATA

TYPE OF CONTAINER	DESCRIPTION	OVER-ALL DIMENSIONS	CAPACITY	WEIGHT
Skid-Crate	1" rough gum lumber for top, sides and bottom, with 2" x 3" skids. Corners reinforced with metal straps.	Inches: 42x42x30 (Volume: 30.63 Cu. Ft.) Centimeters: 107x107x76	300-9" Straights or its equivalent	Empty: 175 lbs. 79 kgs. Packed: 2450 lbs. approx. 1110 kgs.
10-B Carton	Corrugated Carton, with individual brick separators, reinforced with four metal bands.	Inches: 9½x9½x13¼ (Volume: .69 cu. ft.) (Volume: .87 cu. meter) Centimeters: 24x24x34 (Volume: .02 cu. meter)	10-9" Straights or its equivalent	Empty: 1.4 lbs. .6 kgs. Packed: 79 lbs. 35.8 kgs.
20-B Carton	Corrugated B-Flute carton 350-lb. test-bursting strength with individual brick separators, reinforced with four metal bands.	Inches: 10¾x19¼x15⅝ (Volume: 1.63 cu. ft.) Centimeters: 27x49x35 (Volume: .046 cu. meter)	20-9" Straights or its equivalent	Empty: 4.3 lbs. 2. kgs. Packed: 150 lbs. 68 kgs.
Wire-bound Box	⅜" oak matched joint panel: 1⅜" x ⅞" battens and ⅞" x ⅞" tongue and groove cleats of group 3 hardwood. Reinforced with six 13 gauge wires.	Inches: 27¼x19½x15 (Volume: 4.61 cu. ft.) Centimeters: 69x50x38 (Volume: 131 cu. meter)	54-9" Straights or its equivalent	Empty: 29.7 lbs. 13.5 kgs. Packed: 438.5 lbs. 198.9 kgs.

SHOP-MADE CRATES—MADE TO ORDER IN ACCORDANCE WITH TYPE AND SIZE OF TILE

SUGGESTIONS FOR THE SELECTION, CARE, AND USE OF REFRACTORIES

● Do not use refractories of inferior quality or workmanship. The final cost of a fire brick job is not measured by the factory price per thousand brick. It is rather, the cost per unit of product. Remember that inferior workmanship means higher costs in furnace construction.

● If there is any doubt in your mind about the grade of material you should use, send us full information about the furnace and its operating conditions. We will undertake to furnish material which in our judgment, is best suited to your purpose.

● *Always send drawing or samples with initial orders for special shapes to eliminate any chance for errors. Anticipate special shape requirements as far in advance as possible, to give time for their proper manufacture, which normally will require from two to seven weeks—depending on the size and design of the shape.*

● For estimating purposes use the following figures: One square foot of wall 4½" thick will require six and one-half standard fire brick. One square foot, 9" thick, will take thirteen brick, and one square foot 13½" thick will require twenty brick. One cubic foot of brick work requires seventeen standard brick. One thousand brick, tightly stacked, occupy 58 cubic feet, and loosely stacked, 72 cubic feet. A standard fire brick weighs about 7½ pounds and approximately 8,000 of them will make a minimum carload of 60,000 pounds.

● Always store refractories in a dry place. Moisture, in freezing temperatures, will injure them and cause early failure.

● *When ordering, be sure to include material for mortar of a quality at least equal to the quality of the brick. Low quality mortar is very apt to cause failure of the brick. About 400 pounds of fire clay or cement is enough to lay up one thousand brick. Do not add other materials such as Portland cement, lime, or salt, to fire brick mortars.*

● If building long or high walls, be sure to provide for the expansion of the brick work which takes place when it is heated. Put in expansion joints at the rate of 1/16 inch per lineal foot and keep these joints free from mortar. Packing them with cardboard when the joints are narrow, and with mineral wool when large, will accomplish this.

● Heat newly laid fire brick work slowly, and give it air circulation to gradually drive out the moisture. Rapid heating will form steam in the brick and may cause serious damage.

BETTER
MEX-R-CO
REFRACTORIES

REFRACTORY SPECIALTIES

The Mex-R-Co line of Refractory Specialties products is complete—High Temperature Bonding Mortars and Cements; Plastic Firebrick; Castables; Coating Materials; Chrome Base Products; and Plastic Insulation. A product for every need! High quality clays are used in all Mex-R-Co Refractory Specialties products. Recognized laboratory testing and control methods dominate all phases of the manufacturing processes. Simulative and actual service tests determine and establish characteristics; records of service life signify outstanding performance. All point specifically to the fact that Mex-R-Co Refractory Specialties are unreservedly qualified for use in the "Furnaces of Industry".

MONO-FIBRIK

A HIGH GRADE PLASTIC MONOLITHIC FIRE BRICK

● MONO-FIBRIK, because of its distinctly superior qualities, satisfactorily fills an increasing demand for a better plastic fire brick.

This outstanding product is achieved through the use of high grade refractory materials, coupled with years of experience in the manufacture and application of plastic fire brick. It is truly an improved plastic — markedly so in several important respects:

FOR ONE-PIECE FURNACE LINING OR REPAIRING
MEXICO REFRACTORIES COMPANY
MEXICO, MO. U.S.A.
MONO-FIBRIK
A HIGH GRADE PLASTIC MONOLITHIC FIRE BRICK

(1) Because only the very highest grade and carefully selected fire clays are used as a base in MONO-FIBRIK. It is in every sense a high grade fire brick in plastic form. Its P. C. E. is Cone 30-31.

(2) Because the burning shrinkage has been eliminated and MONO-FIBRIK does not tend to crack and check in service.

(3) Because the use of a uniform "grog", or calcined stock, carefully screened and checked, insures a uniform texture, and smooth, easy working properties.

● MONO-FIBRIK only contains high grade grog. This grog is carefully selected, is hard in physical structure and the grains are angular in shape so they will knit together better with the raw clay ingredient—and thus make a better bond.

Careful supervision of the volume mixture of the clay, grog and water ingredients of MONO-FIBRIK in the manufacturing process assures material of uniform plasticity.

Due to the exacting requirements in the choice of brick for shipment to customers and the consequential steady supply of brick with chipped corners and rough edges for grinding into grog, MONO-FIBRIK is made from identically calcined materials from day to day. There is no difference in the basic ingredients. Only uniform ingredients are used.

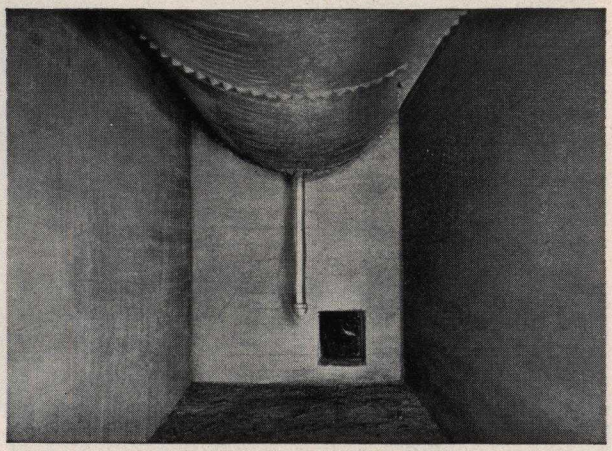
MONO-FIBRIK is not only in wide demand for complete, solid, one-piece furnace linings, but also for miscellaneous repair jobs and as a furnace-room "first-aid". It is packed in 500 lb. and 250 lb. steel drums with tight wooden heads, and also in 100 lb. waterproof paper cartons—a convenient

package for small requirements. Stocked in conveniently located warehouses throughout the country, it is easy to get quick delivery of any quantity for any job—large or small.

MONOLITHIC FURNACE LININGS

In general, joints are a weak part of a furnace lining. Strengthen or eliminate the joints, and the lining is materially improved. Installed piece by piece with a mallet or flatting hammer, MONO-FIBRIK is then trimmed off with a trowel or other sharpedged tool, and finally baked with a slow fire, to produce a monolithic lining without a single joint. The result is a solid, long-lived, air- and gas-tight lining—actually one big fire brick. No joints, no leaks, long life, and cheap construction in the long run.

Walls and settings are easy to build with MONO-FIBRIK. The installation cost is not high, and on the basis of service costs and long life, MONO-FIBRIK has no rival in economy.



Note the absence of joints and cracks in the one-piece "tailor-made" MONO-FIBRIK lining in the above boiler. No air infiltration—no gas leakage.

ELIMINATE BULGING WALLS

Refractory materials expand and contract as heat is applied or taken away. In any furnace, the hotter inner wall expands more than the outer cooler wall. Because there is no compressive force on vertical walls to push the bricks together when they contract on cooling, and because openings left between the bricks become filled with dust and slag so that further movement occurs on reheating, brick walls are weakened by repeated heating and cooling while in service. This may cause the inside wall to bulge out into the furnace and finally to collapse. To overcome this the two walls should be securely tied or anchored together.

MONO-FIBRIK may be anchored securely through the use

of either our MONO Refractory Anchor or the standard MEX-R-CO Metallic Anchor. The use of either of these anchors eliminates bulging and permits free movement of the MONO-FIBRIK wall entirely independent of the outside masonry wall, yet still anchoring or tying the two walls securely together. Anchors should be placed about three feet apart horizontally, and from 18 to 20 inches apart vertically.

WATER WALLS AND TUBES

● Eliminating the necessity for special shapes, MONO-FIBRIK is eminently satisfactory for use with plain tube water walls. Being plastic, it can be fitted to any size tube and any tube center distance. It will give a permanent, first class job, without air leaks. MONO-FIBRIK is excellent for use as a protective refractory on studded tubes in walls and slag screens.

MONO-FIBRIK IDEAL FOR BOILER FRONTS

● The use of MONO-FIBRIK in certain construction is very desirable, as it does away with excessive and troublesome cutting of brick, and fits more tightly and closely about furnace parts. The front walls, door jambs, and arches of H. R. T. boilers, are quickly and cheaply built when MONO-FIBRIK is used and a much better construction is obtained. MONO-FIBRIK will fit snugly around the boiler shell. Linings for cast iron doors, oil burner ports, and flared doors, can all be built advantageously from MONO-FIBRIK. Because it can be easily moulded into any form or shape, MONO-FIBRIK saves time and labor on many kinds of construction.

Complete front wall of MONO-FIBRIK. Note main arch, doors, and close fit of MONO-FIBRIK about header at top.

MONO-FIBRIK FOR ARCH CONSTRUCTION

● For solid, complete arches, MONO-FIBRIK is a decidedly superior product. Exhaustive tests and trials have enabled us to develop the best possible mix to resist spalling, frequently the cause of early failure of arches and roofs. When burned, a MONO-FIBRIK arch can be likened to the span of a concrete bridge—solid, strong, lasting.

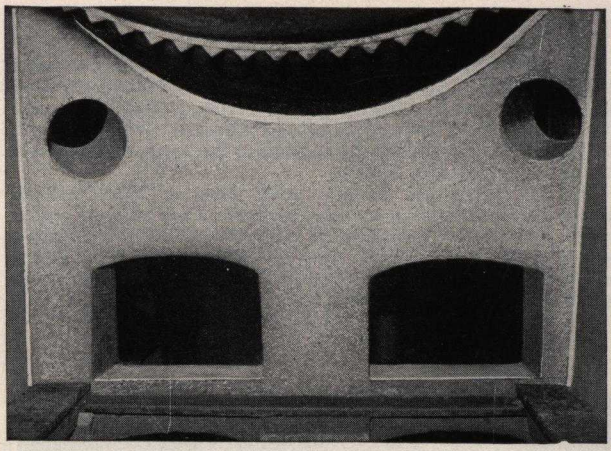
Wooden forms are usually used, both in MONO-FIBRIK wall construction and in building arches. They must be strong and allow no give or spring as the MONO-FIBRIK is pounded in place. Such forms are easy to build and may be easily removed after the MONO-FIBRIK has dried sufficiently to support its own weight without them.

PATCHING AND REPAIRING

Tear out deteriorated section and remove slag. Pound plastic MONO-FIBRIK into place, trim surface and the furnace is ready to put back "on the line."

● MONO-FIBRIK has a definite place in practically every type of furnace where refractories are used, for the many odd patch jobs that are necessary to keep the lining in good repair. It is ideal for this kind of work. No cutting and chipping of brick or tile are necessary to fit them into some small burned-out section. No tearing out of brick that are in good condition in order to get a brick repair properly tied in to the wall.

Patching with MONO-FIBRIK is easy and quick. Simply tear out the old burned-out brick, clean out the cavity, and remove all old mortar and dirt. Take MONO-FIBRIK as it comes in the carton, ready for use, and pound it into the section to be patched. It is good practice to wash over the old brick work with HILOSET before pounding in the MONO-FIBRIK.



Because MONO-FIBRIK is pliable, moulding one-piece linings is a quick easy job. No waste—no expensive cutting. MONO-FIBRIK moulds solidly and tightly around door openings, fuel feed chutes, drums, etc.

REDUCE CLINKER AND SLAGGING TROUBLE

● Because of its monolithic, one-piece construction, MONO-FIBRIK is resistant to the action of clinkering and slagging. The movement of brick walls from expansion and contraction opens up the joints and allows heat, slag, and destructive gases to get into the wall itself, where these destructive agencies attack and speed up the final disintegration of the furnace lining. With MONO-FIBRIK this action is reduced because there are no joints.

LOWER FUEL CONSUMPTION

● Reports from many plants show that MONO-FIBRIK settings have materially reduced fuel consumption and increased furnace efficiency. This is again due to the monolithic construction. MONO-FIBRIK furnace linings are air and gas-tight. Heat loss is reduced. There is no infiltration of cold air into the furnace through leaky joints. A material saving in fuel costs will go a long way toward paying for a MONO-FIBRIK installation, without considering the long life of such a lining.

STOCKED FOR YOUR CONVENIENCE

MONO-FIBRIK is carried in stock in all principal cities throughout the country. Each stock is in charge of a refractories engineer who knows plastic refractories and understands furnace conditions. A MONO-FIBRIK installation costs but little, if any, more than other kinds of construction. Unskilled labor can install MONO-FIBRIK. Proper supervision of the installation can be furnished by our Distributors.

SUPER MONO-FIBRIK

SUPER-DUTY PLASTIC FIREBRICK

● SUPER MONO-FIBRIK—a distinct product of the MEX-R-CO Research and Engineering Departments—was developed to resist devastating spalling action caused by rapidly fluctuating temperatures, and to withstand the most extreme furnace conditions. It is recommended for use where furnaces are overloaded, and where severe reducing conditions are encountered such as in over-rated boilers, firing tunnels, driers, ignition arches, forge furnaces, billet heating furnaces and riveting furnaces. Other typical applications for SUPER MONO-FIBRIK are gas generators, bake ovens, varnish furnaces, asphalt plants, heat treating and metallurgical furnaces, brass and non-ferrous melting furnaces.

SUPER MONO-FIBRIK, designed for the "tough" job, embodies physical properties which are unusual for Super Plastic Firebrick:

High Melting Point • *Unique Load Bearing Ability*
Unsurpassed Resistance To Spalling
Exceptional Resistance To Vitrification
Remarkable Pliancy and Workability
Excellent Resistance To Penetration

The method of installing SUPER MONO-FIBRIK is the same as for Regular MONO-FIBRIK; the difference is in the application to meet different and specific service and operating conditions. SUPER MONO-FIBRIK comes packed in the same size Drums and Cartons as Regular MONO-FIBRIK—ready and easy to install.

●

MAX-BOND

● MAX-BOND is an air-setting Special Super-duty Plastic Firebrick product, designed principally for use where low-temperature strength is important. The outstanding characteristic of MEX-R-CO MAX-BOND is its maximum bonding strength, which develops throughout the entire lining—regardless of the furnace operating temperatures, or the thickness of the lining.

MAX-BOND is recommended for use in applications where a monolithic lining of exceptionally high strength is desired, such as arches and piers in spreader stoker-fired furnaces, forge furnace lintel tile, door linings, preformed burner blocks and other special shapes.

(Note: MAX-BOND contains a slight amount of sulphur; therefore caution should be exercised in its application. It should not be used in ceramic kilns or other places where even traces of sulphur fumes might be detrimental.)

MAX-BOND is shipped in plastic form, in 100-lb. fibre board cartons, sliced, ready for easy installation by hand or air-hammer.

MISCELLANEOUS INFORMATION

Estimating Requirements One cubic foot of MONO-FIBRIK weighs approximately 133-1/3 pounds. For the quantity required for a job, figure the number of square feet of wall surface and multiply this by the thickness, in feet, of the MONO-FIBRIK lining desired. This gives the contents in cubic feet and, when multiplied by 133-1/3 pounds, the total quantity of MONO-FIBRIK needed is obtained.

When walls are tapered, use the AVERAGE thickness. For example if the wall is to be 9" thick at the bottom, tapered to 5" thick at the top, use the average thickness, or 7". The following table can be used to estimate quantities of MONO-FIBRIK per square foot of wall surface, of various thicknesses.

Wall Thickness	Quantity Per Square Foot	Wall Thickness	Quantity Per Square Foot
5"	54 lbs.	9"	98 lbs.
6"	65 "	10"	109 "
7"	75 "	11"	120 "
8"	87 "	12"	130 "

As a general rule a MONO-FIBRIK wall should not be over 12" nor less than 4½" thick. When too thick, sufficient heat is not obtained through to the back of the wall, to burn it in. Where the width of the dead plate does not exceed 12", front walls should be same thickness.

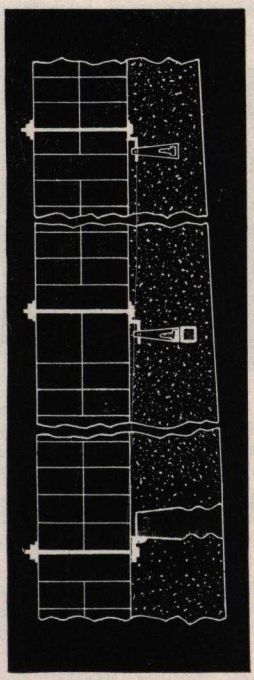
Opening Drums When the entire contents are to be used, the drum should be split lengthwise with an ax, and spread open flat. Split the contents in quarters lengthwise. Convenient sized pieces can then be chopped off.

If only a portion of a drum of MONO-FIBRIK is to be used, knock out one head, take out the quantity needed, and cover the remainder with wet burlap. The burlap should be kept moist until the rest of the material in the drum is used.

Freezing MONO-FIBRIK can freeze and should be thawed before using. Cutting it up will hurry the thawing process, and it can be hurried still more by covering with canvas and turning live steam under the canvas. If after thawing, it appears excessively wet, drying a few hours will return it to workable condition.

When Dried After Long Storage When stored in a cool, damp place, MONO-FIBRIK will remain in good condition for from six to eight months. If it becomes too dry to satisfactorily pack and knit in a wall, it can be re-conditioned by breaking it up, sprinkling with water and covering it with wet burlap for a few hours, or over-night. DO NOT use it if re-conditioning it has made it excessively wet. In this case, it should be dried out a little before using. When used it should be of a putty like consistency, not sloppy or sticky.

WAV-LOK ANCHOR

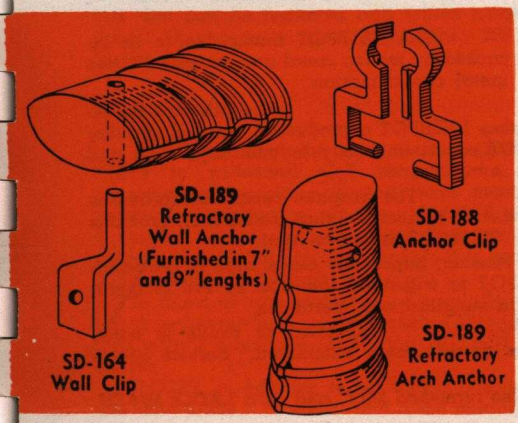


The MEX-R-CO WAV-LOK wall and arch anchors have been designed to contribute longer life to monolithic plastic fire brick furnace installations by affording safe, certain anchorage.

The unique wave-lock, two-way flare design, the ability to withstand high temperatures, the flexibility in application and the freedom of movement combine to make MEX-R-CO WAV-LOK Anchors a distinct advancement in MONO-FIBRIK arch and wall construction. The sequence of the few simple steps to be followed in installing the WAV-LOK wall anchor assembly are as follows:

Bolt the clip to the outer brick wall; rest the anchor on the shoulder of the clip until ready to be seated in the plastic. When embedding the anchor keep the anchor slot centered between the tip and shoulder of the prong; use a board as a cushion in pounding anchor in place. Make sure the plastic is packed tightly around the anchor waves. Before continuing the plastic wall pack insulation between the clip and wall, or insert a cardboard shield in front of the clip to prevent any of the plastic from being forced in behind the clip and hindering free movement of the anchor.

Exceptional strength has been provided in the SD series of anchors through the WAV-LOK design, and the high quality metal used in manufacture.



REFRACTORY ANCHORS

Of unusual structural strength, and tapered to provide safe, strong anchorage, the MONO Refractory Anchor Tile is easily installed on hook bolts (as pictured at left.) The rounded edges prevent checking or cracking where the MONO-FIBRIK wall comes in contact with the anchor face.

HELSPOT

● HELSPOT is a Super-quality Plastic Firebrick designed for use in lining metallurgical furnaces and ladles. HELSPOT is composed of a Missouri Super-quality refractory, scientifically blended in combination with a special Graphite, especially sized for mixture with refractory ingredients and chemically sealed into the mix.

Factory-mixed, to the correct putty-like consistency, and packaged in 100-lb. waterproof cartons and 500-lb. steel drums, HELSPOT comes ready to install. In cartons it comes already sliced into six convenient slices for ease of handling.

● HELSPOT has a wide field of use in the Foundry. Any application in the grey-iron foundry, malleable-iron foundry, steel foundry and non-ferrous shop, wherein the refractory is covered with molten metal or slag, affords an excellent place to employ HELSPOT.

● HELSPOT is recommended particularly for lining all types and sizes of foundry ladles (pouring, holding, transfer, shank, etc.), and spouts of melting units. The "No-Slag" feature of this material makes it a "MUST" for today's spout lining.

● HELSPOT is also recommended for use in steel foundries in which temperatures encountered are high and where ordinary linings are short-lived due to inability to counter the unusually corrosive slag.

● HELSPOT has many outstanding qualities; the following are a few of them:

CLEANER CASTINGS— The HELSPOT lining due to its resistance to erosion caused by molten metal and corrosive action of slag minimizes metal contamination.

WITHSTANDS TEMPERATURE SHOCK— The Missouri Super-duty clay base makes HELSPOT a product of unusual spalling resistance; HELSPOT reacts uniformly to both expansion and contraction.

LUBRICATED SURFACE— The graphite component promotes easy flowing of metal, minimizes slag formation, prohibits metal penetration. HELSPOT is non-wetting.

HIGH FUSION— Missouri Super-duty clays, high in refractoriness enable HELSPOT to withstand the most severe temperatures encountered in metallurgical operations.

EASE OF SLAG REMOVAL— Removal of skulls is easy; bridged ladles are in most cases eliminated. Service life is increased.

● HELSPOT is also furnished DRY, and as a LADLE WASH.

HILOSET

FOR HIGH LOW TEMPERATURES

● HILOSET is the ideal all-purpose high temperature bonding mortar. It will set and bond at ordinary temperatures without the application of heat. This air-setting bond is of great strength and is maintained until an even stronger ceramic bond is obtained by the application of heat. For this reason HILOSET is ideal for use either in low temperatures or in high heat duty service. It will not melt to form a destructive slag at high temperature, but forms instead a joint as strong as the brick itself and just as refractory.

HILOSET has all the requirements necessary for a fine quality mortar, namely: high fusion point and air setting properties, a combination rarely found in refractory cements, —low shrinkage — plasticity, and strength under heat.

HILOSET is packed, ready to use, in steel containers with lids that can be replaced and which keep the container air tight. They come in sizes of 500 lbs., 200 lbs., 100 lbs. and 25 lbs.

HIGH FUSION

● Principal among the many characteristics of HILOSET is its ability to withstand high temperatures. Nature endowed minerals and specially treated clays impart to HILOSET an unusually high fusion. In fact, HILOSET is so refractory that it can be considered one of the best general purpose high temperature mortars on the market; it is recommended for use under severe conditions.

The finest of raw materials, a specially designed manufacturing technique and constant control through scientific laboratory testing contribute to making HILOSET the ideal bonding mortar.

HILOSET, in addition to producing a solid wall, makes thin gas tight joints. Fire clay and some mortars will shrink under

heat, and may work out of the joints, leaving the ends of the brick exposed to heat, gas and slags, on all sides. HILOSET keeps the destructive slags out of the joints.

The completely bonded and closed joints obtained with HILOSET make a furnace tight. No loss of furnace gases nor infiltration of air through leaky joints occurs, which means high efficiency and lower fuel consumption.

SMOOTH WORKABILITY

● In the manufacture of HILOSET the important precision-blending of clay ingredients, predetermined by laboratory technicians, is comparable to the exacting accuracy with which the pharmacist compounds a prescription.

Of no less importance is the final step of machine mixing, in which the finely and carefully ground ingredients are thoroughly distributed, and properly mixed to remain in suspension. A plastic consistency is developed which produces a velvet-smooth workability—a quality in which HILOSET is unsurpassed.

NO SHRINKAGE

● Firebrick failure generally starts at the joint — but not so when the firebrick are laid-up with HILOSET. Tailor-made as it is, HILOSET is non-shrinking.

By controlled calcination and the application of modern research methods in blending the many ingredients contained in HILOSET it is possible to remove the element of shrinkage in the manufacture of HILOSET.

The co-efficient of expansion of HILOSET is such that it expands and contracts in marked unison with the brick it bonds. Consequently, the joints present as strong a line of defense against the devastations of combustion as the brick themselves, and the arch or wall surface stands as a solid unit — and at all temperatures.

USES FOR HILOSET

Laying Firebrick HILOSET adapts itself well to dipping or to troweling. For dipping add only water, stir to thick creamy consistency, dip brick and tap firmly into place. Depending on the manner of use, and the uniformity of the brick, from 350 to 400 pounds of HILOSET are required to lay and brush coat 1000 firebrick.

Surfacing For prolonging the life of old walls, by stopping up leaks to prevent slag penetration and air infiltration, coat them with HILOSET. Remove dust, ashes, loose slag and dirt from the old brick work and apply HILOSET as a wash. On new fire brick construction, it is good practice to apply a thin coating of HILOSET over the surface. It will fill up the pores of the brick, and the wall will present a smooth glazed surface. Mix the HILOSET with water in the proportion of 6 parts of HILOSET and 1 part (by volume) of water. The coating should be thin, less than 1/16", and can be put on with a gun for handling wet materials or with a brush or broom. For greater thicknesses use SPRAY MIX.

Arches Sprung arches laid up with HILOSET will not work loose and brick will not fall out of them. When installing suspended arches, wash the fire side of the finished arch with HILOSET mortar after the tile are hung in place, to secure an arch that is sealed and free from leakage. *Do not pour HILOSET on top of the arch.*

Pointing-Up HILOSET, direct from the drum, may be used for troweling and for pointing-up joints, filling voids and evening up slightly worn firebrick surfaces.

●

BOND SET

SILICA BASE HIGH TEMPERATURE MORTAR

● BOND SET is a silica base high temperature bonding mortar, developed especially for use in hot-patch work on both fire clay and silica brick. It is air-setting and of extra heavy consistency, making it suitable (1) for laying firebrick where "heavy" joints are desired; (2) for patching spalled sections of coke oven door jambs and for building up worn floor tile; (3) for pointing up wall cracks and general stoppage of gas leaks; (4) for hot-patch troweling while unit is in operation to prolong the life of any refractory installation.

BOND SET possesses great strength, smooth workability, and is non-shrinking. It is manufactured from siliceous clays, ground, sized, and factory-mixed to insure proper blending and thorough distribution of all ingredients. BOND SET comes in 100-lb., 200-lb. and 500-lb. air-tight steel drums, ready for troweling, pointing or patching. Only 350 to 400 pounds required to lay 1000 brick.

SUPER HILOSET

FOR SUPER-DUTY SERVICE

● SUPER HILOSET possesses the same unusual characteristics as regular HILOSET, except that it is SUPER in quality. Kyanite, a mineral of High Alumina content and an extremely high fusion point, is a basic component of SUPER HILOSET.

SUPER HILOSET not only has super fusion and super workability properties but possesses super strength. It does not soften at high temperatures; the bond remains constant. Being air-setting SUPER HILOSET develops a strong bond at atmospheric temperatures, the bond increasing under heat to produce a strong ceramic bond which is maintained throughout the entire temperature range.

SUPER HILOSET is especially recommended for laying and surfacing Super-Duty Firebrick used in furnaces operating under reducing conditions. It is also strongly recommended for use in metallurgical furnaces where resistance to penetration is essential and where severe corrosive action is present.

SUPER HILOSET is packed, ready to use, in steel containers with lids that can be replaced and which keep the container air tight. They come in sizes of 500 lbs., 200 lbs., 100 lbs. and 25 lbs.

●

MEX-R-CO SPRAY GUN

● For surfacing walls with HILOSET and for applying coatings of SPRAY MIX, spraying with a cement gun is the better method. Upon request we will gladly furnish a blue print of a simple and efficient gun which can be economically made of pipe fittings.

●

HILO-CHROME

(Wet or Dry)

● HILO-CHROME is a super-chrome cement, prepared for use in all types of industrial furnaces where excessive temperatures and extreme conditions prevail. It is made of the highest grade African chrome ore—P. C. E. Cone 38 (3335 degrees Fahrenheit)—and in addition to its unusual resistance to high heat, has great hot load strength, is neutral to either acid or basic slag and resists the penetration of molten metal, corrosive gases, abrasion and chemical erosion.

HILO-CHROME is air-setting, does not flux and is highly resistant to the destructive elements of combustion. It comes in both plastic (wet) or dry form and is as smooth working as fire clay; works equally well dipped, troweled, poured, brushed or sprayed. HILO-CHROME Wet is packed in 250-lb. steel drums; HILO-CHROME Dry comes in 200-lb. drums.

LO-SET

LO-SET is HILOSET in dry form. It comes in 100-lb. waterproof sacks and can be prepared for use in a few minutes time. LO-SET makes a smooth, easy-flowing mortar of exceptional workability. It has a negligible shrinkage and develops a strong bond at atmospheric temperatures, which is greatly increased with the application of heat.

LO-SET may also be used as a brush or spray coat for fire brick surfaces, and works equally well dipped, sprayed, brushed, or troweled.

HY-SET

HY-SET is a high temperature bonding mortar for laying fire brick and fire clay tile. It develops a strong bond at furnace temperatures of approximately 1200° F. to 3100° F. There are no air-setting properties—heat is necessary to obtain a tight, bonded joint.

Where a dry bonding mortar is desired HY-SET is a most desirable product. Made from the highest grade clays, its fusion is equal to the best grades of fire brick. It forms a close, tight joint, when brick are dipped—not troweled—and tends to increase the life of a fire brick lining, as well as to increase furnace efficiency and reduce fuel costs, because of the air and gas-tight joint obtained. This is insured both by its strong bond, as well as by its very minimum shrinkage. It is shipped dry, in 100 lb. cloth sacks.

M-5

INSULATING FIRE BRICK MORTAR

M-5 INSULATING CEMENT is a wet (paste form) cement. It is air-setting, high in fusion, and acquires a permanent ceramic bond. Its use will not only lengthen the service life of Insulating Refractories, but by properly sealing the joints, assist in retarding the flow of heat through the furnace wall.

M-5 INSULATING CEMENT is packed in 250 and 100 lb. air-tight steel drums. It is machine mixed, making it possible to lay Insulating Fire Brick with the thinnest of dipped joints. M-5 INSULATING CEMENT is shipped ready for use—only 350 to 400 pounds being required to lay 1,000 brick.

FURNAS-CRETE

MIX-AND-POUR REFRACTORY CONCRETE

● FURNAS-CRETE is the solution for many furnace-room problems. It is a fool-proof refractory furnace concrete shipped ready for mixing with water, and can be conveniently used wherever a poured mixture is necessary or desirable. It can be mixed to any desired consistency and develops a strong air-set in a relatively short time. At atmospheric temperatures FURNAS-CRETE acquires a strong, hydraulic bond. Higher temperatures produce an even stronger ceramic bond which is retained up to the fusion point of approximately 2700 degrees F.

For use under and along the sides of the dead plates of small stokers FURNAS-CRETE is vastly superior to most materials heretofore used for this purpose. For pouring hearths in small-sized furnace installations where no dead plates are used it is better than fire clay or a mixture of crushed brick and a bonding agent.

Air leaks are a bane in small stokers, being a source of constant trouble, since air infiltration through hearths and walls results in low combustion efficiency. As a result of the careful compounding of the constituents of FURNAS-CRETE it has practically no shrinkage, does not crack in drying, and has a low coefficient of expansion. Because of these qualities FURNAS-CRETE has found great favor among many companies manufacturing stokers.

A serviceable lining of much longer life for firing and inspection doors is assured with FURNAS-CRETE. When the door is not flared the lining should be held in place by some form of anchor. It may also be used for lining ash hoppers.

FURNAS-CRETE is unexcelled as a furnace concrete for making special shapes on the job. A collapsible form, which can be knocked apart, preferably well oiled with a heavy grease or lined with oiled paper, cut to fit, will serve. A thick mixture of FURNAS-CRETE can be tamped in, then left for at least 12 hours to thoroughly air-set.

FURNAS-CRETE is packed in 50-lb. and 100-lb. bags.

SUPER FURNAS-CRETE

● SUPER FURNAS-CRETE is made of Super-duty clays, blended with a high temperature bonding agent which gives it the ability to withstand higher temperatures than first quality castables. SUPER FURNAS-CRETE has all the desirable characteristics of standard FURNAS-CRETE, plus higher fusion.

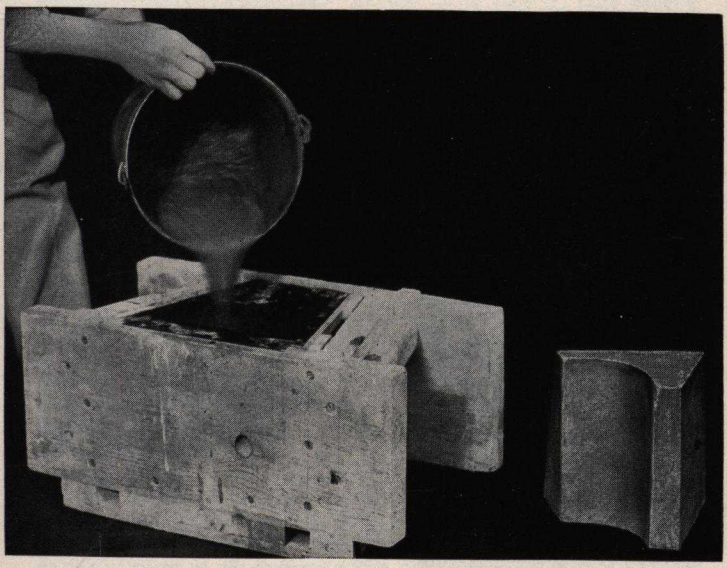
MILL-CRETE

SPECIAL REFRACTORY CASTABLE

● MILL-CRETE is a specially prepared refractory castable designed by the MEX-R-CO Research Department to fill the need for a high quality castable in the steel mill. It is recommended for lining open hearth flues and ducts, and soaking pit sidewalls and covers.

As with other MEX-R-CO castable products MILL-CRETE is shipped dry, in 100-lb. water-proof bags, ready for mixing with water. By carefully controlling the water content in the mixing process a desired consistency can be obtained suitable for either ramming MILL-CRETE in place, or pouring, to produce a strong, solid, high temperature lining. Safe anchorage can be simply provided; for any special application designs, information as to recommended methods of anchoring will be gladly supplied upon request.

MILL-CRETE is low in shrinkage and has high resistance to abrasion and spalling. It produces a tough, impenetrable structure that will withstand high operating temperatures. It has a bulk density of 126 to 131-lbs. per cubic foot. Where application by gunning is desired a special mix of MILL-CRETE, for this purpose, can be furnished on request. ●



SPECIAL SHAPES . . . mix and pour in collapsible mould . . . Presto! . . . a tile is "Manufactured" on the job.

I-R-C

LIGHT WEIGHT INSULATING REFRACTORY CONCRETE

● I-R-C is a scientifically compounded refractory mixture that combines all of the advantages of a mix-and-pour castable with desirable insulating properties. Although having a clay base that imparts both high refractoriness and resistance to spalling, I-R-C possesses a cellular structure which accounts for its low thermal conductivity . . . approximately 40% of that of firebrick. This results in reduced heat loss, less heat storage which in turn favors faster heating up, and more economical operation.

I-R-C is recommended where an insulating refractory is required. It is especially suited for casting into door linings, for lining breechings, convection sections and flues, for building oil burner combustion chambers, tube decks, floors and hearths of annealing furnaces. I-R-C is air-setting and is easily mixed and poured; will not shrink in drying. Packed in 50 lb. and 100 lb. waterproof bags. (One cubic foot of matured material requires 80 lbs. of dry material.)

●

I-R-C 20

● I-R-C 20 is a Lightweight Insulating Refractory Castable, similar in many respects to Regular I-R-C (described above) except that being lighter in weight it has greater insulating properties.

With an installed weight ranging between 48 and 52 pounds per cubic foot I-R-C 20 has a thermal conductivity of approximately 70% less than that of high-heat duty fire clay brick. It is easily mixed, is plastic and workable, and can be cast in place, troweled, or gunned. I-R-C 20 may be used safely in temperatures up to 2000° F.; throughout the entire working temperature range it possesses good strength and volume characteristics. I-R-C 20 is packaged in 50-lb. moisture-proof bags.

ENGINEERING SERVICE

● The MEX-R-CO Engineering staff stands ready to assist in recommending correct materials and construction techniques in connection with the installation of any refractory lining. This service is available without obligation.

GUNNING MIXTURES

MEX-R-CO Castable Refractory products, applied by the REFRACT-O-RITE Gun method, possess superior physical characteristics of strength, refractoriness, load-bearing ability, density, and minimum shrinkage.

I-R-C (C-709-G)

● Insulating Refractory Concrete, suitable for use up to 2500° F., bulk density, when gun applied, 80-82-lbs. per cubic foot. The percent mixing water is 40-45% by weight.

I-R-C 20-G (C-706-G)

● Light-weight Insulating Refractory Concrete, suitable for use up to 1800° F; bulk density, when gun applied, 48-52-lbs. per cubic foot. The percent mixing water required is 46-50% by weight.

FURNAS-CRETE (F-303-G)

● First Quality Castable suitable for use up to 2600° F; bulk density, when gun applied, 119-121-lbs. per cubic foot. The percent of mixing water required is 16-20% by weight.

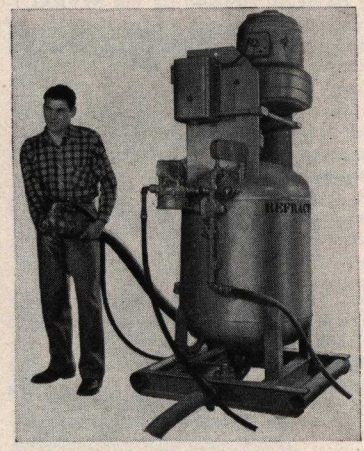
SUPER FURNAS-CRETE (F-322-G)

● Super Quality Castable, recommended for use at service temperatures up to 2800° F. Bulk density, when gun applied, 126-130-lbs. per cubic foot. The percent of mixing water required is 15-18% by weight.

SPECIAL MIX

● While the standard line of MEX-R-CO Castable Products, designed for Gun Application, meet the majority of operating conditions there are occasional circumstances which require special attention. Where such special conditions exist our Engineering Research Department would be glad to study the specific problem (without obligation), make recommendations and either develop a "SPECIAL MIX" or suggest some one of our other modified mixes tailored to meet applicaiton requirements.

REFRACT-O-RITE GUN



● The principle of gun emplacement of refractory materials is not new, but the REFRACT-O-RITE method of pneumatic placement is the more widely accepted because of:

1—Less rebound loss

2—Time- and labor-saving application

3—Factor of density variable

4—Adjustable pressure to suit distance to target

5—Maneuverability of gun on the job

6—Utilization as a conveying medium

7—Economy of operation

MINIMUM REBOUND LOSS

The REFRACT-O-RITE Gun overcomes separation of the aggregates, improper wetting, and excessive rebound loss. The correct amount of water is added to the dry materials in the mixing chamber, thoroughly mixed and tempered. Proper balance and suspension is maintained as it is conveyed through the hose. At the nozzle additional, lever-controlled, air pressure—*NO* water!—is introduced to spray the tempered material, with proper velocity, on the target. There is less than 5% rebound loss. There is no sluffing. Even and uniform textures result. By absolute control of the water in the mixing process an ideal hydraulic set is obtained.

The gun can be quickly charged; approximately eight cubic feet of material—the capacity of the gun—can be applied in fifteen minutes or less. Casting-molds or forms are not required to shape or contain the refractory until it sets, which is another saving the REFRACT-O-RITE Gun method affords.

DENSITY EASILY CONTROLLED

Finger-tip control permits applying the refractory material with a dense, abrasion-resisting mass, or an open, porous-type, insulating body. Not only is a well bonded texture achieved, whatever the density, but the uniform consistency of the flow permits an even coating, a gradual building-up and a strong, homogenous structure. Depending upon the conditions—and the results desired—shooting can be successfully accomplished at distances ranging from one to ten feet.

The REFRACT-O-RITE Gun can be economically used for pneumatically conveying material to any ground level or elevated location.

BAFFLE CRETE

● BAFFLE CRETE—a specially designed castable refractory concrete product — is particularly recommended for the construction of monolithic baffles in water tube boilers. Shipped dry, (50-lb. and 100-lb. bags) BAFFLE CRETE comes ready for mixing with water; the wet mixture may be poured like concrete.

BAFFLE CRETE is hydraulic setting and will develop a strong bond regardless of the temperature in the tube banks. In service it successfully resists strains caused by vibration, and because of its scientifically blended granular structure, determined by careful laboratory testing, it maintains a strong, solid body and resists cracking. Monolithic baffles, built of BAFFLE CRETE, are gas-tight and will increase furnace efficiency by improving combustion, and decrease fuel consumption by preventing the by-passing of valuable gases.

Other uses for which BAFFLE CRETE is recommended are: construction of water wall studding, and for the manufacture, on the job, of certain special shapes where resistance to vibration strains is important. A cubic foot of matured FURNAS-CRETE or BAFFLE CRETE requires 108 pounds of dry material.

SPRAY MIX

● SPRAY MIX is a refractory coating material designed to lengthen the life of any refractory surface to which it is applied. With a fusion point equal to that of first quality fire brick, it is especially recommended for use in building up and resurfacing spalled and worn fire brick walls and arches. Of a very plastic nature, SPRAY MIX adheres readily to any clean refractory surface, whether applied with a spray gun or with a trowel. It develops an exceedingly strong ceramic bond under ordinary furnace operating conditions. SPRAY MIX is shipped in 100 and 200-pound steel drums ready for use.

MEX-LOX

● MEX-LOX is a jointing mortar for use in laying firebrick in various metal melting operations of the foundry and the steel mill. Following are features which mark it as an unusual mortar:

1. Highly resistant to attack by slag or metal.
2. Resists erosion; retards brick scouring.
3. Develops firm joint; can be dipped or troweled.
4. Non-shrinking; will maintain full joint.
5. High P.C.E.; more refractory than most firebrick.
6. Resists spalling and deterioration in service.
7. Brick may be easily broken away for repair or replacement.

MEX-LOX fills the demand in the metallurgical industry for a mortar that will hold brick firmly in place during service, but will release them readily when the need arises for tearing out the wall or lining for repair or replacement.

● MEX-LOX has a P.C.E. of Cone 36. It contains no air-setting ingredients, but bonds well because of the high plasticity of the bonding clays it contains. MEX-LOX is suitable for dipping or troweling in laying firebrick, and can be used for spraying or brushing as a protective coating or for filling cracks and crevices.

In the melting zone of cupolas the joint is the point most subject to erosion as a result of slag attack. MEX-LOX resists erosion and retards joint deterioration, thus lengthening the life of the cupola lining.

In malleable iron furnaces where side walls require frequent repair along the metal line, MEX-LOX is an ideal mortar for laying firebrick because it will hold joints firm, resists scouring action and yet permits easy removal of damaged brick for replacement.

In ladles and many types of metal-melting furnaces where slag attack is severe, and where linings are frequently replaced or periodically repaired, MEX-LOX is recommended because of its characteristics as a jointing material and the ease of breaking joints for removing damaged brick.

In electric furnaces where brick are frequently laid up dry and where a high-strength bonding mortar is not desirable, MEX-LOX is suitable because it seals joints against penetration of gases and slag, affording protection and preventing deep vitrification.

MEX-LOX is finely ground. It is shipped in dry form in 100-lb. bags ready for mixing with water.

PLASTIC INSULATION

● MEX-R-CO PLASTIC INSULATION is an insulating cement in which (1) absence of shrinkage, (2) unusual covering capacity, (3) attractive appearance and (4) remarkable insulating efficiency mark it as an economical and superior product.

PLASTIC INSULATION is made with a base of specially prepared mineral fibre combined with other ingredients which together produce great adhesiveness, practically no shrinkage, exceptional workability and unexcelled insulating value. It is recommended for insulating valves, large piping, flanges, steam gates, flues, ducts, boiler setting tanks, heaters, furnaces—any hot surface where saving of heat is worthwhile.

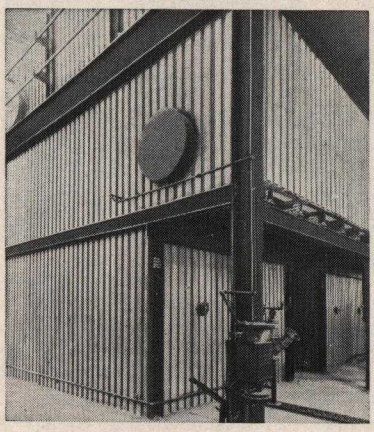
PLASTIC INSULATION is easily applied by hand or trowel. It should preferably be applied to warm surfaces to insure uniform drying. It is so adhesive that on the average application it will readily adhere to any clean, unpainted surface—without chicken wire or other re-inforcement—in thickness up to 2 inches. Fifty pounds covers 12 sq. ft. to a thickness of 2 in.

The Thermal Conductivity of MEX-R-CO PLASTIC INSULATION is relatively low and when it is used to coat the outside of furnace walls (1½ inches to 2 inches thick), it (1) decreases infiltration of air (2) reduces heat loss (3) minimizes temperature fluctuation, therefore decreases spalling and (4) reduces fuel consumption.

MEX-R-CO PLASTIC INSULATION is equal to magnesia at low temperatures and is efficient up to 1800 degrees Fahr.; it is reclaimable—if used in temperatures of less than 1000 degrees, it may be mixed with water and used again. It requires no finish coat; is low in cost (Per foot of coverage), and is durable—resistant to severe usage and vibration.

MEX-R-CO STEEL CASING

● The latest advancement in boiler settings is the *MEX-R-CO STEEL ENCASED SETTING*—and because of its many advantages it is gaining wide favor among boiler engineers anxious to achieve more economical boiler settings, longer setting life and more efficient boiler operation. It provides positive heat-insulation. The outside boiler setting wall is formed by welding sections of Steel Casing in an upright position and fastening to boiler structural members.



1. **Lower Installation Cost**
2. **Less Erection Time**
3. **Adaptable To Any Type Setting**
4. **Engineered For Permanence**
5. **Improve Furnace Efficiency**
6. **Minimize Air-Infiltration**
7. **Cut Heat Loss**
8. **Lighter But Stronger Construction**
9. **Longer Lasting**
10. **Reduce Wall Load Weight On Foundation**
11. **Requires Little Maintenance**
12. **Easy To Keep Clean, Neat In Appearance**

● The MEX-R-CO STEEL CASING is equally suitable for any type setting—H. R. T. boilers, dutch ovens, incinerators, water tube boilers. It is economical in overall construction cost—materials, labor, time.

The wide flutes not only provide more-than-ample strength to the upright but they give the setting a neat, modern appearance. The steel work can be painted, and the only maintenance required is a possible re-painting to keep it clean. It is lighter in weight, reducing wall load, requiring less supporting steelwork, and minimizing space requirements.

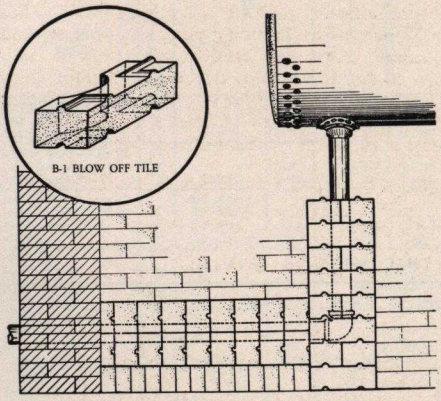
● The MEX-R-CO STEEL ENCASED SETTING is not only more economical in first-cost construction, but it materially improves furnace efficiency and aids in prolonging the life of the refractory setting. here is no air-infiltration, or gas leakage, since with the solid steel wall there are no brick joints to work loose. Consequently heat loss is reduced and fuel cost lessened.

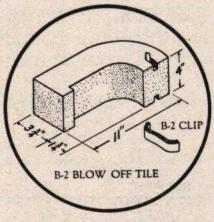
FACTS ABOUT MEX-R-CO STEEL CASING

Width of Casing Sections----------2 feet
Length of Casing Sections----------Up to 25 feet
Weight Per Square Foot in Pounds----------5.1 pounds
Overall Depth in Inches----------1.60 inches
Coefficient of Strength (*)----------7,440 (fs=18,000 psi)

(*) To find the allowable uniformly distributed load for any span divide the Coefficient of Strength by the square of the span length in feet. Average deflection on an 11-foot span with load of 50-lbs. per square foot will be less than 1/250th of the length of the span.

BLOW OFF PIPE PROTECTOR TILE



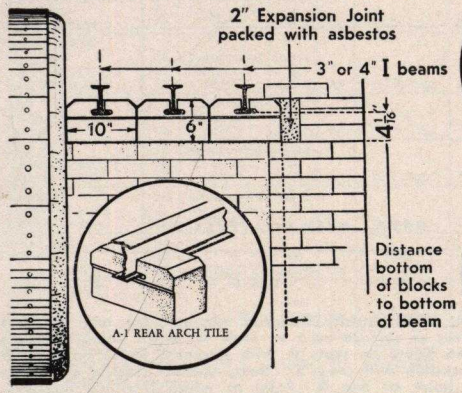


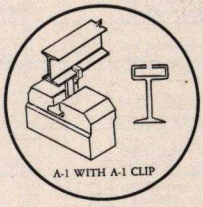
The MEX-R-CO B-1 Blow Off Pipe Protector Tile has an interlocking tongue-and-groove feature that insures rigid construction when installed. Easy to remove . . . just as easily replaced.

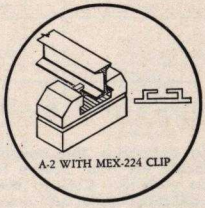
The B-2 Blow-Off Pipe Protector unit forms a horseshoe shape, with the back open. This design allows for easy pipe inspection without necessitating removal of any tile. Alloy metal clips fit into slots and hold the tile solidly in units.

The tile fit blow off pipes of 5-inch diameter, or less, is either vertical or horizontal position. Two tile comprise a set; three sets required per running foot of pipe.

REAR ARCH TILE (For H. R. T. Boilers)

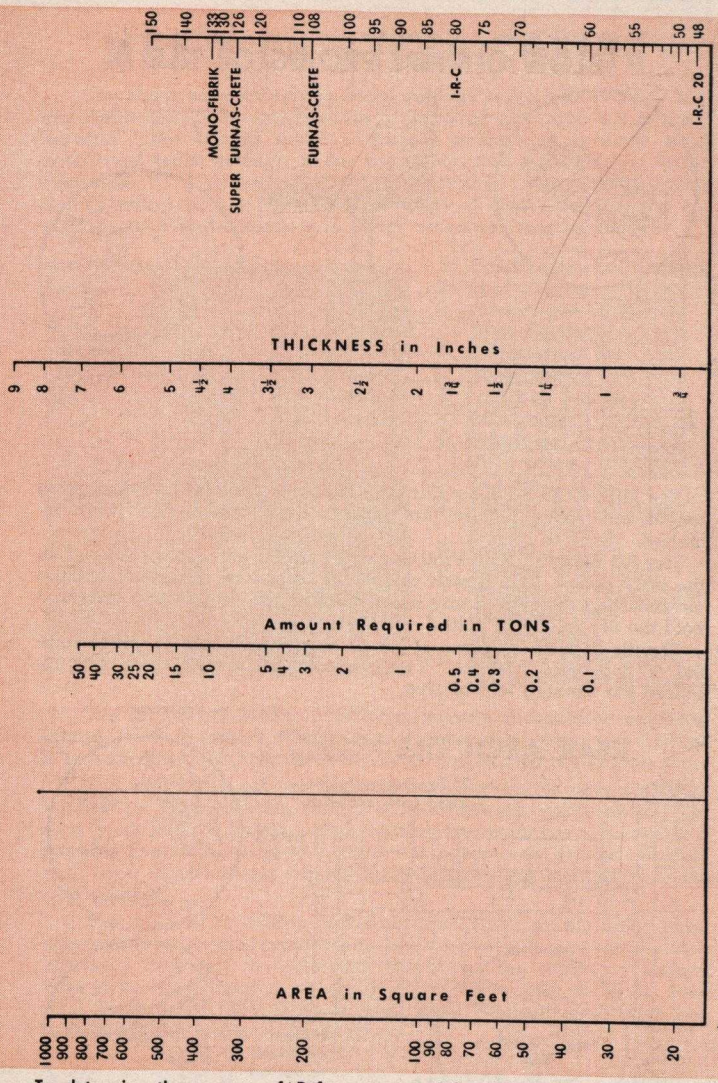






MEX-R-CO Rear Arch Tile are designed for use in Horizontal Return Tubular boiler settings. They are easy to hang, and just as easy to remove. No mortar is necessary as the specially designed offset prevents air-infiltration or gas leakage. This type of installation eliminates end thrust against the rear wall.

MEX-R-CO LINOGRAPH COMPUTATOR



To determine the amount of Refractory material required for any job first locate the total square feet of surface area on scale A; select lining thickness on scale D. Connect area figure on scale A with thickness figure on scale D and mark point of intersection with line B. Next, connect density figure on scale E with intersected point on line B. Point at which this line intersects scale C indicates the amount of material, in tons, required.

Example: Take a wall surface of 400 square feet, to be lined with I-R-C 20 to a thickness of 4". Connect the "400" on scale A with "4" on scale D. Note point of intersection on line B; connect this point with "48" (density figure for I-R-C 20) on scale E. Point at which this line intersects at scale C is 3.20, indicating approximately 3¼ tons of I-R-C 20 will be required for the job.

PROPERTIES OF MEX-R-CO REFRACTORY SPECIALTIES

PRODUCT NAME	ALUMINA-SILICA RATIO	P. C. E.	AIR OR HEAT SETTING	HOW PACKAGED	STANDARD PACKAGE AND NET WEIGHT	LBS. REQ'D. PER CUBIC FOOT	APPROX. LBS. REQ'D TO LAY 1000 9" STRAIGHT BRICK	APPROX. LBS. REQ'D PER SQ. FT. 1/8" THICK COATING	HOW INSTALLED
MONO-FIBRIK First Quality Plastic Firebrick	1.0 to 2.0	Cone 31	Heat Setting	Wet	100 lb. cartons 500 lb. drums	133			Hand or pneumatic ramming
SUPER MONO-FIBRIK Super Quality Plastic Firebrick	4.5 to 5.2	Cone 33	Heat Setting	Wet	100 lb. cartons 500 lb. drums	133			Hand or pneumatic ramming
HELSPOT Special Plastic Firebrick for Metallurgical Processes	2.7 to 6.6	Recommended for Foundry Pouring Temperatures	Heat Setting	Wet or Dry	100 lb. cartons 100 lb. bags	130			Hand or pneumatic ramming
HILOSET First Quality High Temperature Bonding Mortar	3.8 to 5.4	Cone 32-33	Air Setting	Wet	7 lb., 25 lb., 100 lb., 200 lb., 500 lb. drums		350 to 400	1½ lb.	Dipped or troweled joints; may be brushed or sprayed
SUPER HILOSET Super Quality High Temperature Bonding Mortar	4.9 to 4.2	Cone 33	Air Setting	Wet	7 lb., 25 lb., 100 lb., 200 lb., 500 lb. drums		350 to 400	1½ lb.	Dipped or troweled joints; may be brushed or sprayed
LO-SET First Quality High Temperature Bonding Mortar	3.4 to 5.8	Cone 32-33	Air Setting	Dry	100 lb. bags		290 to 325	1¼ lb.	Dipped or troweled joints; may be brushed or sprayed
HY-SET First Quality High Temperature Bonding Mortar	4.3 to 4.9	Cone 33	Heat Setting	Dry	100 lb. bags		290 to 325	1¼ lb.	Dipped or troweled joints; may be brushed or sprayed
BOND SET Silica Base Bonding Mortar	0.7 to 8.8	Cone 23	Air Setting	Wet	25 lb., 100 lb., 200 lb., 500 lb. drums		350 to 400	1½ lb.	Dipped or troweled joints
MEX-LOX Jointing Material	1.8 to 1.0	Cone 36	Heat Setting	Dry	100 lb. bags		290 to 325		Dipped or troweled joints
M-5 Insulating Firebrick High Temperature Mortar	3.0 to 5.1	Cone 30	Air Setting	Wet	25 lb., 100 lb., 200 lb., 500 lb. drums		350 to 400	1½ lb.	Dipped or troweled joints
FURNAS-CRETE First Quality Castable Refractory	4.0 to 4.5	Recommended for use up to 2600° F	Hydraulic Setting	Dry	50 lb., 100 lb. bags	108			Cast or tamped into mold or form
SUPER FURNAS-CRETE Super Quality Castable Refractory	1.0 to 1.0	Recommended for use up to 2950° F	Hydraulic Setting	Dry	100 lb. bags	108			Cast or tamped into mold or form
BAFFLE CRETE First Quality Castable Refractory for Baffle Construction	4.0 to 4.5	Recommended for use up to 2600° F	Hydraulic Setting	Dry	100 lb. bags	108			Cast or tamped into mold or form
I-R-C Insulating Refractory Castable	3.9 to 4.3	Recommended for use up to 2400° F	Hydraulic Setting	Dry	50 lb., 100 lb. bags	70			Cast in mold or form
I-R-C 20 Lightweight Insulating Refractory Concrete	1.2 to 4.6	Recommended for use up to 2000° F	Hydraulic Setting	Dry	50 lb. Bags	50			Cast in form or gunned in place
MEXICAST Intermediate Quality Castable Refractory	3.2 to 4.9	Recommended for use up to 2400° F	Hydraulic Setting	Dry	100 lb. bags	108			Cast or tamped into mold or form
SPRAY MIX First Quality Refractory Coating	4.0 to 5.0	Cone 32	Air Setting	Wet	100 lb., 200 lb. drums	130		1½ lb.	Troweled, brushed or sprayed on wall
MONO-CHROME Chrome Base Plastic Refractory	Chromite Base	Cone 39	Heat Setting	Wet	250 lb. drums	200			Hand or pneumatic ramming
HILO-CHROME Chrome Base High Temperature Bonding Mortar	Chromite Base	Cone 37	Air Setting	Wet or Dry	250 lb. drums 100 lb. bags		400 to 450	1½ lb.	Dipped or troweled joints
CHROME-CONCRETE Chrome Base Refractory Concrete	Chromite Base	Cone 35	Air Setting	Dry	100 lb. bags	190			Cast or tamped into mold or form
MEX-R-CO PLASTIC INSULATION	Mineral Fibre	1800° F	Air Setting	Dry	50 lb. bags			¼ lb.	By hand or troweled in place

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

The tables on this, and succeeding pages, are intended to be helpful in determining the quantities of different series shapes required to turn circles of given diameters.

No allowance was made for mortar joints, expansion joints or deviations in the size of brick in computing the tables. Fractional parts of one tenth of a brick or more were counted as an entire brick; smaller fractions were disregarded.

9 x 4½ x 2½-INCH ARCH BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE				
	No. 3 Arch 9" x 4½" x (2½" —1")	No. 2 Arch 9" x 4½" x (2½" —1¾")	No. 1 Arch 9" x 4½" x (2½" —2⅛")	Straight 9" x 4½" x 2½"	Total
0'—6"	19	..	..	..	19
0'—9"	15	8	..	..	23
1'—0"	12	15	..	..	27
1'—6"	4	30	..	..	34
2'—0"	..	34	8	..	42
2'—6"	..	26	23	..	49
3'—0"	..	19	38	..	57
3'—6"	..	11	53	..	64
4'—0"	..	4	68	..	72
4'—3"	..	..	76	..	76
4'—6"	..	..	76	4	80
5'—0"	..	..	76	11	87
5'—6"	..	..	76	19	95
6'—0"	..	..	76	26	102
6'—6"	..	..	76	34	110
7'—0"	..	..	76	41	117
7'—6"	..	..	76	49	125
8'—0"	..	..	76	56	132
8'—6"	..	..	76	64	140
9'—0"	..	..	76	71	147
9'—6"	..	..	76	79	155
10'—0"	..	..	76	87	163
10'—6"	..	..	76	94	170
11'—0"	..	..	76	102	178
11'—6"	..	..	76	109	185
12'—0"	..	..	76	117	193
12'—6"	..	..	76	124	200
13'—0"	..	..	76	132	208
13'—6"	..	..	76	139	215
14'—0"	..	..	76	147	223

THIS TABLE APPLIES ALSO TO 13½ x 4½ x 2½-INCH ARCH BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

9 x 4 ½ x 2 ½-INCH WEDGE BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE			
	No. 2 Wedge 9" x 4½" x (2½"—1½")	No. 1 Wedge 9" x 4½" x (2½"—1⅞")	Straight 9" x 4½" x 2½"	Total
2'—3"	57	..	..	57
2'—6"	51	10	..	61
3'—0"	38	30	..	68
3'—6"	25	51	..	76
4'—0"	13	70	..	83
4'—6"	..	91	..	91
5'—0"	..	91	7	98
5'—6"	..	91	15	106
6'—0"	..	91	22	113
6'—6"	..	91	30	121
7'—0"	..	91	38	129
7'—6"	..	91	45	136
8'—0"	..	91	53	144
8'—6"	..	91	60	151
9'—0"	..	91	68	159
9'—6"	..	91	75	166
10'—0"	..	91	83	174
10'—6"	..	91	90	181
11'—0"	..	91	98	189
11'—6"	..	91	105	196
12'—0"	..	91	113	204
12'—6"	..	91	121	212
13'—0"	..	91	128	219
13'—6"	..	91	136	227
14'—0"	..	91	143	234
14'—6"	..	91	151	242
15'—0"	..	91	158	249
15'—6"	..	91	166	257
16'—0"	..	91	173	264
16'—6"	..	91	181	272
17'—0"	..	91	188	279
17'—6"	..	91	196	287
18'—0"	..	91	203	294
18'—6"	..	91	211	302
19'—0"	..	91	219	310
19'—6"	..	91	226	317
20'—0"	..	91	234	325
20'—6"	..	91	241	332
21'—0"	..	91	249	340
21'—6"	..	91	256	347
22'—0"	..	91	264	355
22'—6"	..	91	271	362
23'—0"	..	91	279	370

THIS TABLE APPLIES ALSO TO 9 x 6¾ x 2½-INCH WEDGE BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

12 x 6 x 3-INCH WEDGE BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE				
	No. 3 Wedge 12" x 6" x (3" — 2")	No. 2 Wedge 12" x 6" x (3" — 2½")	No. 1 Wedge 12" x 6" x (3" — 2¾")	Straight 12" x 6" x 3"	Total
4'—0"	76	..	..	..	76
4'—6"	69	13	..	..	82
5'—0"	63	25	..	..	88
5'—6"	57	38	..	..	95
6'—0"	51	50	..	..	101
6'—6"	44	63	..	..	107
7'—0"	38	75	..	..	113
7'—6"	32	88	..	..	120
8'—0"	25	101	..	..	126
8'—6"	19	113	..	..	132
9'—0"	13	126	..	..	139
9'—6"	7	138	..	..	145
10'—0"	..	151	..	..	151
10'—6"	..	144	13	..	157
11'—0"	..	139	25	..	164
11'—6"	..	132	38	..	170
12'—0"	..	126	50	..	176
12'—6"	..	120	63	..	183
13'—0"	..	113	76	..	189
13'—6"	..	107	88	..	195
14'—0"	..	101	100	..	201
14'—6"	..	95	113	..	208
15'—0"	..	88	126	..	214
15'—6"	..	82	138	..	220
16'—0"	..	76	151	..	227
16'—6"	..	69	164	..	233
17'—0"	..	63	176	..	239
17'—6"	..	57	188	..	245
18'—0"	..	51	201	..	252
18'—6"	..	44	214	..	258
19'—0"	..	38	226	..	264
19'—6"	..	32	239	..	271
20'—0"	..	25	252	..	277
20'—6"	..	19	264	..	283
21'—0"	..	13	276	..	289
21'—6"	..	7	289	..	296
22'—0"	..	..	302	..	302
22'—6"	..	..	302	6	308
23'—0"	..	..	302	13	315
23'—6"	..	..	302	19	321
24'—0"	..	..	302	25	327
24'—6"	..	..	302	31	333
25'—0"	..	..	302	38	340

THIS TABLE APPLIES ALSO TO 12 x 4½ x 3 AND 12 x 9 x 3-INCH WEDGE BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

13½ x 6 x 3-INCH WEDGE BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE				
	No. 3 Wedge 13½" x 6" x (3" — 2")	No. 2 Wedge 13½" x 6" x (3" — 2½")	No. 1 Wedge 13½" x 6" x (3" — 2¾")	Straight 13½" x 6" x 3"	Total
4'—6"	85	..	..	..	85
5'—0"	79	13	..	..	92
5'—6"	73	25	..	..	98
6'—0"	66	38	..	..	104
6'—6"	60	50	..	..	110
7'—0"	54	63	..	..	117
7'—6"	47	76	..	..	123
8'—0"	41	88	..	..	129
8'—6"	35	100	..	..	135
9'—0"	29	113	..	..	142
9'—6"	22	126	..	..	148
10'—0"	16	138	..	..	154
10'—6"	10	151	..	..	161
11'—0"	3	164	..	..	167
11'—3"	..	170	..	..	170
11'—6"	..	167	6	..	173
12'—0"	..	160	19	..	179
12'—6"	..	154	32	..	186
13'—0"	..	148	44	..	192
13'—6"	..	141	57	..	198
14'—0"	..	135	70	..	205
14'—6"	..	129	82	..	211
15'—0"	..	123	94	..	217
15'—6"	..	116	107	..	223
16'—0"	..	110	120	..	230
16'—6"	..	104	132	..	236
17'—0"	..	97	145	..	242
17'—6"	..	92	157	..	249
18'—0"	..	85	170	..	255
18'—6"	..	79	182	..	261
19'—0"	..	72	195	..	267
19'—6"	..	66	208	..	274
20'—0"	..	60	220	..	280
20'—6"	..	53	233	..	286
21'—0"	..	48	245	..	293
21'—6"	..	41	258	..	299
22'—0"	..	35	270	..	305
22'—6"	..	28	283	..	311
23'—0"	..	22	296	..	318
23'—6"	..	16	308	..	324
24'—0"	..	9	321	..	330
24'—6"	..	4	333	..	337
24'—9"	..	..	340	..	340
25'—0"	..	..	340	3	343

THIS TABLE APPLIES ALSO TO 12 x 4½ x 3 AND 12 x 9 x 3-INCH WEDGE BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

9 x 4½ x 2½-INCH KEY BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE					
	No. 4 Key 9" x (4½" — 2¼") x 2½"	No. 3 Key 9" x (4½" — 3") x 2½"	No. 2 Key 9" x (4½" — 3½") x 2½"	No. 1 Key 9" x (4½" — 4") x 2½"	Straight 9" x 4½" x 2½"	Total
1'—6"	26	..	..	..	..	26
2'—0"	17	13	..	..	..	30
2'—6"	9	25	..	..	..	34
3'—0"	..	38	..	..	..	38
3'—6"	..	29	13	..	..	42
4'—0"	..	21	25	..	..	46
4'—6"	..	13	38	..	..	51
5'—0"	..	4	51	..	..	55
5'—3"	..	..	57	..	..	57
5'—6"	..	..	55	4	..	59
6'—0"	..	..	50	13	..	63
6'—6"	..	..	46	21	..	67
7'—0"	..	..	42	30	..	72
7'—6"	..	..	38	38	..	76
8'—0"	..	..	34	46	..	80
8'—6"	..	..	29	55	..	84
9'—0"	..	..	25	63	..	88
9'—6"	..	..	21	72	..	93
10'—0"	..	..	17	80	..	97
10'—6"	..	..	13	88	..	101
11'—0"	..	..	9	96	..	105
11'—6"	..	..	4	105	..	109
12'—0"	..	..	..	113	..	113
12'—6"	..	..	..	113	5	118
13'—0"	..	..	..	113	9	122
13'—6"	..	..	..	113	13	126
14'—0"	..	..	..	113	17	130
14'—6"	..	..	..	113	21	134
15'—0"	..	..	..	113	26	139
15'—6"	..	..	..	113	30	143
16'—0"	..	..	..	113	34	147
16'—6"	..	..	..	113	38	151
17'—0"	..	..	..	113	42	155
17'—6"	..	..	..	113	47	160
18'—0"	..	..	..	113	51	164
18'—6"	..	..	..	113	55	168
19'—0"	..	..	..	113	59	172
19'—6"	..	..	..	113	63	176
20'—0"	..	..	..	113	68	181
20'—6"	..	..	..	113	72	185
21'—0"	..	..	..	113	76	189
21'—6"	..	..	..	113	80	193
22'—0"	..	..	..	113	84	197
22'—6"	..	..	..	113	88	201

THIS TABLE APPLIES ALSO TO 9 x 4½ x 3-INCH KEY BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

12 x 6 x 3-INCH KEY BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE			
	No. 2 Key 12″ x (6″—5″) x 3″	No. 1 Key 12″ x (6″—5½″) x 3″	Straight 12″ x 6″ x 3″	Total
10′—0″	76	..	..	76
10′—6″	72	7	..	79
11′—0″	69	13	..	82
11′—6″	66	19	..	85
12′—0″	63	25	..	87
12′—6″	60	32	..	92
13′—0″	57	38	..	95
13′—6″	54	44	..	98
14′—0″	51	50	..	101
14′—6″	47	57	..	104
15′—0″	44	63	..	107
15′—6″	41	69	..	110
16′—0″	38	75	..	113
16′—6″	35	82	..	117
17′—0″	32	88	..	120
17′—6″	29	94	..	123
18′—0″	25	101	..	126
18′—6″	22	107	..	129
19′—0″	19	113	..	132
19′—6″	16	119	..	135
20′—0″	13	126	..	139
20′—6″	10	132	..	142
21′—0″	7	138	..	145
21′—6″	3	145	..	148
22′—0″	..	151	..	151
22′—6″	..	151	3	154
23′—0″	..	151	6	157
23′—6″	..	151	10	161
24′—0″	..	151	13	164
24′—6″	..	151	16	167
25′—0″	..	151	19	170
25′—6″	..	151	22	173
26′—0″	..	151	25	176
26′—6″	..	151	28	179
27′—0″	..	151	32	183
27′—6″	..	151	35	186
28′—0″	..	151	38	189
28′—6″	..	151	41	192
29′—0″	..	151	44	195
29′—6″	..	151	47	198
30′—0″	..	151	50	201
30′—6″	..	151	54	205
31′—0″	..	151	57	208
31′—6″	..	151	60	211
32′—0″	..	151	63	214

THIS TABLE APPLIES ALSO TO 9 x 6 x 2½-INCH KEY BRICK.

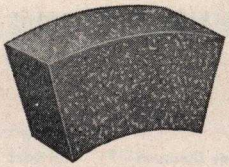
COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

13½ x 6 x 3-INCH KEY BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE			
	No. 2 Key 13½" x (6"—4⅜") x 3"	No. 1 Key 13½" x (6"—5") x 3"	Straight 13½" x 6" x 3"	Total
6'—0"	52	..	..	52
6'—6"	48	7	..	55
7'—0"	43	16	..	59
7'—6"	38	24	..	62
8'—0"	33	32	..	65
8'—6"	28	40	..	68
9'—0"	23	48	..	71
9'—6"	18	56	..	74
10'—0"	13	64	..	77
10'—6"	8	73	..	81
11'—0"	3	81	..	84
11'—3"	..	85	..	85
11'—6"	..	85	2	87
12'—0"	..	85	5	90
12'—6"	..	85	8	93
13'—0"	..	85	11	96
13'—6"	..	85	14	99
14'—0"	..	85	18	103
14'—6"	..	85	21	106
15'—0"	..	85	24	109
15'—6"	..	85	27	112
16'—0"	..	85	30	115
16'—6"	..	85	33	118
17'—0"	..	85	36	121
17'—6"	..	85	39	124
18'—0"	..	85	43	128
18'—6"	..	85	46	131
19'—0"	..	85	49	134
19'—6"	..	85	52	137
20'—0"	..	85	55	140
20'—6"	..	85	58	143
21'—0"	..	85	61	146
21'—6"	..	85	65	150
22'—0"	..	85	68	153
22'—6"	..	85	71	156
23'—0"	..	85	74	159
23'—6"	..	85	77	162
24'—0"	..	85	80	165
24'—6"	..	85	83	168
25'—0"	..	85	87	172
25'—6"	..	85	90	175
26'—0"	..	85	93	178
26'—6"	..	85	96	181
27'—0"	..	85	99	184

THIS TABLE APPLIES ALSO TO 13½ x 6 x 2½-INCH KEY BRICK.

COMBINATIONS OF SIZES OF CIRCLE BRICK REQUIRED TO TURN CIRCLES



9 x 4 ½ x 2 ½-INCH

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE					
	24-33 (9"—6 17/32") x 4½" x 2½"	36-45 (9"—7 3/16") x 4½" x 2½"	48-57 (9"—7 19/32") x 4½" x 2½"	60-69 (9"—7 13/16") x 4½" x 2½"	72-81 (9"—8") x 4½" x 2½"	Total
2'—0"	12	..	..	..	..	12
2'—3"	9	4	..	..	..	13
2'—6"	6	8	..	..	..	14
2'—9"	3	12	..	..	..	15
3'—0"	..	16	..	..	..	16
3'—3"	..	12	5	..	..	17
3'—6"	..	8	10	..	..	18
3'—9"	..	4	15	..	..	19
4'—0"	..	..	20	..	..	20
4'—3"	..	..	16	5	..	21
4'—6"	..	..	10	12	..	22
4'—9"	..	..	4	19	..	23
5'—0"	..	..	..	24	..	24
5'—3"	..	..	..	17	9	26
5'—6"	..	..	..	12	15	27
5'—9"	..	..	..	6	22	28

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE					
	72-81 (9"—8") x 4½" x 2½"	84-93 (9"—8⅛") x 4½" x 2½"	96-105 (9"—8 7/32") x 4½" x 2½"	108-117 (9"—8 5/16") x 4½" x 2½"	120-129 (9"—8⅜") x 4½" x 2½"	Total
6'—0"	29	..	..	..	..	29
6'—3"	21	9	..	..	..	30
6'—6"	14	17	..	..	..	31
6'—9"	7	25	..	..	..	32
7'—0"	..	33	..	..	..	33
7'—3"	..	23	11	..	..	34
7'—6"	..	14	21	..	..	35
7'—9"	..	5	31	..	..	36
8'—0"	..	..	37	..	..	37
8'—3"	..	..	25	13	..	38
8'—6"	..	..	18	21	..	39
8'—9"	..	..	10	30	..	40
9'—0"	..	..	..	41	..	41
9'—3"	..	..	..	34	8	42
9'—6"	..	..	..	23	20	43
9'—9"	..	..	..	13	31	44
10'—0"	..	..	..	..	45	45

THIS TABLE APPLIES ALSO TO 9 x 4½ x 3-INCH CIRCLE BRICK.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

FLAT BACK ARCH BRICK

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE			
	No. 2 Flat Back Arch 9″ x 6″ x (3½″—2″)	No. 1 Flat Back Arch 9″ x 6″ x (3½″—2½″)	Flat Back Straight 9″ x 6″ x 2½″	Total
1′—4″	26	..	..	26
1′—6″	22	5	..	27
1′—9″	16	14	..	30
2′—0″	11	22	..	33
2′—3″	5	30	..	35
2′—6″	..	38	..	38
3′—0″	..	38	8	46
3′—6″	..	38	15	53
4′—0″	..	38	23	61
4′—6″	..	38	30	68
5′—0″	..	38	38	76
5′—6″	..	38	45	83
6′—0″	..	38	53	91
6′—6″	..	38	60	98
7′—0″	..	38	68	106
7′—6″	..	38	75	113
8′—0″	..	38	83	121
8′—6″	..	38	91	129
9′—0″	..	38	98	136
9′—6″	..	38	106	144
10′—0″	..	38	113	151

9 x 9 x 4½-INCH CALLIAU BLOCKS

Inside Diam.	NUMBER REQUIRED TO TURN CIRCLE								
	A 9″ x (9″—5¾″) x 4½″	B 9″ x (9″—6⁵⁄₁₆″) x 4½″	C 9″ x (9″—6¾″) x 4½″	D 9″ x (9″—6¹⁵⁄₁₆″) x 4½″	E 9″ x (9″—7¹¹⁄₃₂″) x 4½″	F 9″ x (9″—7²¹⁄₃₂″) x 4½″	G 9″ x (9″—7¹³⁄₁₆″) x 4½″	H 9″ x (9″—8″) x 4½″	Total
1′—4″	9	..	..	..	..	..	..	..	9
1′—6″	6	4	..	..	..	..	..	..	10
1′—9″	..	11	..	..	..	..	..	..	11
2′—0″	..	6	6	..	..	..	..	..	12
2′—3″	..	..	13	..	..	..	..	..	13
2′—6″	..	..	..	14	..	..	..	..	14
3′—0″	..	..	..	6	10	..	..	..	16
3′—4″	..	..	..	..	18	..	..	..	18
3′—6″	..	..	..	..	14	4	..	..	18
4′—0″	..	..	..	..	5	15	..	..	20
4′—3″	..	..	..	..	..	21	..	..	21
4′—6″	..	..	..	..	..	14	8	..	22
5′—0″	..	..	..	..	..	..	24	..	24
5′—6″	..	..	..	..	..	..	12	15	27
6′—0″	..	..	..	..	..	..	..	29	29

NOTE: Fractional parts of one tenth of a brick or more are counted as entire brick; smaller fractions are disregarded.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

9 x 6 x 4 - INCH CUPOLA AND ROTARY KILN BLOCKS

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE					
	30-42 (9"-6 7/16") x 6" x 4"	36-48 (9"-6 3/4") x 6" x 4"	42-54 (9"-7") x 6" x 4"	48-60 (9"-7 3/16") x 6" x 4"	54-66 (9"-7 3/8") x 6" x 4"	Total
2'-6"	15	..	..	..	..	15
2'-9"	8	8	..	..	..	16
3'-0"	..	17	..	..	..	17
3'-3"	..	8	10	..	..	18
3'-6"	..	..	19	..	..	19
3'-9"	..	..	9	11	..	20
4'-0"	..	..	..	21	..	21
4'-3"	..	..	..	10	12	22
	54-66 (9"-7 3/8") x 6" x 4"	60-72 (9"-7 1/2") x 6" x 4"	66-78 (9"-7 5/8") x 6" x 4"	72-84 (9"-7 23/32") x 6" x 4"	78-90 (9"-7 13/16") x 6" x 4"	Total
4'-6"	23	..	..	..	..	23
4'-9"	13	11	..	..	..	24
5'-0"	..	26	..	..	..	26
5'-3"	..	14	13	..	..	27
5'-6"	..	..	28	..	..	28
5'-9"	..	..	16	13	..	29
6'-0"	..	..	..	30	..	30
6'-3"	..	..	..	18	13	31
	78-90 (9"-7 13/16") x 6" x 4"	84-96 (9"-7 7/8") x 6" x 4"	90-102 (9"-7 15/16") x 6" x 4"	96-108 (9"-8") x 6" x 4"	102-114 (9"-8 1/16") x 6" x 4"	Total
6'-6"	32	..	..	..	..	32
6'-9"	19	14	..	..	..	33
7'-0"	..	34	..	..	..	34
7'-3"	..	16	19	..	..	35
7'-6"	..	..	36	..	..	36
7'-9"	..	..	17	20	..	37
8'-0"	..	..	..	38	..	38
8'-3"	..	..	..	22	17	39
	102-114 (9"-8 1/16") x 6" x 4"	108-120 (9"-8 3/32") x 6" x 4"	114-126 (9"-8 5/32") x 6" x 4"	120-132 (9"-8 3/16") x 6" x 4"	123-135 (9"-8 3/16") x 6" x 4"	Total
8'-6"	40	..	..	..	..	40
8'-9"	22	19	..	..	..	41
9'-0"	..	42	..	..	..	42
9'-3"	..	24	19	..	..	43
9'-6"	..	..	44	..	..	44
9'-9"	..	..	36	9	..	45
10'-0"	..	..	..	46	..	46
10'-3"	..	..	..	..	48	48

NOTE: Fractional parts of one tenth of a brick or more are counted as entire brick; smaller fractions are disregarded.

COMBINATIONS OF BRICK SIZES REQUIRED TO TURN CIRCLES

9 x 9 x 4-INCH CUPOLA AND ROTARY KILN BLOCKS

Inside Diameter	NUMBER REQUIRED TO TURN CIRCLE						Total
	48-66 (9"-6 17/32") x 9" x 4"	54-72 (9"-6 3/4") x 9" x 4"	60-78 (9"-6 15/16") x 9" x 4"	66-84 (9"-7 1/16") x 9" x 4"	72-90 (9"-7 3/16") x 9" x 4"	78-96 (9"-7 5/16") x 9" x 4"	
4'-0"	23	..	..	..	..	..	23
4'-3"	11	13	..	..	..	..	24
4'-6"	..	26	..	..	..	..	26
4'-9"	..	14	13	..	..	..	27
5'-0"	..	..	28	..	..	..	28
5'-3"	..	..	15	14	..	..	29
5'-6"	..	..	..	30	..	..	30
5'-9"	..	..	..	12	19	..	31
6'-0"	..	..	..	..	32	..	32
6'-3"	..	..	..	..	14	19	33
	78-96 (9"-7 5/16") x 9" x 4"	84-102 (9"-7 13/32") x 9" x 4"	90-108 (9"-7 1/2") x 9" x 4"	96-114 (9"-7 19/32") x 9" x 4"	102-120 (9"-7 21/32") x 9" x 4"	108-126 (9"-7 23/32") x 9" x 4"	Total
6'-6"	34	..	..	..	..	..	34
6'-9"	16	19	..	..	..	..	35
7'-0"	..	36	..	..	..	..	36
7'-3"	..	17	20	..	..	..	37
7'-6"	..	..	38	..	..	..	38
7'-9"	..	..	22	17	..	..	39
8'-0"	..	..	..	40	..	..	40
8'-3"	..	..	..	27	14	..	41
8'-6"	..	..	..	..	42	..	42
8'-9"	..	..	..	..	25	18	43
	108-126 (9"-7 23/32") x 9" x 4"	114-132 (9"-7 25/32") x 9" x 4"	117-135 (9"-7 13/16") x 9" x 4"	120-138 (9"-7 13/16") x 9" x 4"	123-141 (9"-7 27/32") x 9" x 4"	126-144 (9"-7 7/8") x 9" x 4"	Total
9'-0"	44	..	..	..	..	..	44
9'-3"	27	18	..	..	..	..	45
9'-6"	..	46	..	..	..	..	46
9'-9"	..	..	48	..	..	..	48
10'-0"	..	..	..	49	..	..	49
10'-3"	..	..	..	..	50	..	50
10'-6"	..	..	..	..	..	51	51
	126-144 (9"-7 7/8") x 9" x 4"	132-150 (9"-7 29/32") x 9" x 4"	138-156 (9"-7 31/32") x 9" x 4"	144-162 (9"-8") x 9" x 4"	150-168 (9"-8 1/32") x 9" x 4"		Total
10'-9"	14	38	..	..	..		52
11'-0"	..	53	..	..	..		53
11'-3"	..	24	30	..	..		54
11'-6"	..	..	55	..	..		55
11'-9"	..	..	34	22	..		56
12'-0"	..	..	..	57	..		57
12'-3"	..	..	..	24	34		58
12'-6"	..	..	..	..	59		59

NOTE: Fractional parts of one tenth of a brick or more are counted as entire brick; smaller fractions are disregarded.

BRICK FOR ARCHES OF VARIOUS RISES AND SPANS

4½-INCH ARCH THICKNESS—2-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Arch	No. 1 Arch	Straight	Total
1′– 0″	2″	10″	8	..	..	8
1′– 3″	2 1/2″	1′– 0 1/2″	7	2	..	9
1′– 6″	3″	1′– 3″	5	5	..	10
1′– 7″	3 5/32″	1′– 3 27/32″	5	6	..	11
1– 9″	3 1/2″	1′– 5 1/2″	4	8	..	12
2′– 0″	4″	1′– 8″	3	10	..	13
2′– 3″	4 1/2″	1′–10 1/2″	2	12	..	14
2′– 4″	4 21/32″	1′–11 11/32″	1	14	..	15
2′– 5″	4 27/32″	2′– 0 5/32″	1	14	..	15
2′– 6″	5″	2′– 1″	1	15	..	16
3′– 0″	6″	2′– 6″	..	16	2	18
3′– 6″	7″	2′–11″	..	16	5	21
4′– 0″	8″	3′– 4″	..	16	7	23
4′– 6″	9″	3′– 9″	..	16	10	26
5′– 0″	10″	4′– 2″	..	16	12	28
5′– 6″	11″	4′– 7″	..	16	15	31
6′– 0″	12″	5′– 0″	..	16	18	34
6′– 6″	1′– 1″	5′– 5″	..	16	20	36
7′– 0″	1′– 2″	5′–10″	..	16	23	39
7′– 6″	1′– 3″	6′– 3″	..	16	25	41
8′– 0″	1′– 4″	6′– 8″	..	16	28	44

This table applies to 9x4½x2½ and 13½x4½x2½-inch Series Arch Brick

9-INCH ARCH THICKNESS—1.608-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Wedge	No. 1 Wedge	Straight	Total
1′– 6″	2 13/32″	1′– 6″	7	5	..	12
1′– 9″	2 13/16″	1′– 9″	4	9	..	13
2′– 0″	3 7/32″	2′– 0″	2	12	..	14
2′– 3″	3 5/8″	2′– 3″	..	15	..	15
2′– 6″	4 1/32″	2′– 6″	..	15	2	17
3′– 0″	4 13/16″	3′– 0″	..	15	4	19
3′– 6″	5 5/8″	3′– 6″	..	15	7	22
4′– 0″	6 7/16″	4′– 0″	..	15	9	24
4′– 6″	7 1/4″	4′– 6″	..	15	12	27
5′– 0″	8 1/32″	5′– 0″	..	15	14	29
5′– 6″	8 27/32″	5′– 6″	..	15	17	32
6′– 0″	9 21/32″	6′– 0″	..	15	19	34
6′– 6″	10 7/16″	6′– 6″	..	15	22	37
7′– 0″	11 1/4″	7′– 0″	..	15	24	39
7′– 6″	1′– 0 1/16″	7′– 6″	..	15	27	42
8′– 0″	1′– 0 7/8″	8′– 0″	..	15	29	44

This table applies to 9x4½x2½, 9x6¾x2½, and 9x9x2½-inch Series Wedge Brick

BRICK FOR ARCHES OF VARIOUS RISES AND SPANS

9-INCH ARCH THICKNESS—2-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Wedge	No. 1 Wedge	Straight	Total
1′– 6″	3″	1′– 3″	11	2	..	13
1′– 9″	3½″	1′– 5½″	8	6	..	14
2′– 0″	4″	1′– 8″	6	9	..	15
2′– 3″	4½″	1′–10½″	4	13	..	17
2′– 6″	5″	2′– 1″	2	16	..	18
2′– 9″	5½″	2′– 3½″	..	19	..	19
3′– 0″	6″	2′– 6″	..	19	1	20
3′– 6″	7″	2′–11″	..	19	4	23
4′– 0″	8″	3′– 4″	..	19	7	26
4′– 6″	9″	3′– 9″	..	19	9	28
5′– 0″	10″	4′– 2″	..	19	12	31
5′– 6″	11″	4′– 7″	..	19	14	33
6′– 0″	12″	5′– 0″	..	19	17	36
6′– 6″	1′– 1″	5′– 5″	..	19	19	38
7′– 0″	1′– 2″	5′–10″	..	19	22	41
7′– 6″	1′– 3″	6′– 3″	..	19	25	44
8′– 0″	1′– 4″	6′– 8″	..	19	27	46

This table applies to 9x4½x2½, 9x6¾x2½ and 9x9x2½-inch Series Wedge Brick

9-INCH ARCH THICKNESS—2-5/16-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Wedge	No. 1 Wedge	Straight	Total
1′– 6″	3 15/32″	1′– 1 1/32″	14	..	..	14
1′– 9″	4 1/32″	1′– 3 11/16″	11	4	..	15
2′– 0″	4 19/32″	1′– 5 15/16″	9	7	..	16
2′– 3″	5 3/16″	1′– 8 3/16″	7	11	..	18
2′– 6″	5 3/4″	1′–10 7/16″	5	14	..	19
2′– 9″	6 11/32″	2′– 0 21/32″	2	18	..	20
3′– 0″	6 29/32″	2′– 2 29/32″	..	21	..	21
3′– 6″	8 1/16″	2′– 7 13/32″	..	21	3	24
4′– 0″	9 7/32″	2′–11 7/8″	..	21	6	27
4′– 6″	10 3/8″	3′– 4 3/8″	..	21	8	29
5′– 0″	11 1/2″	3′– 8 27/32″	..	21	11	32
5′– 6″	1′– 0 21/32″	4′– 1 11/32″	..	21	14	35
6′– 0″	1′– 1 13/16″	4′– 5 13/16″	..	21	16	37
6′– 6″	1′– 2 31/32″	4′–10 5/16″	..	21	19	40
7′– 0″	1′– 4 1/8″	5′– 2 25/32″	..	21	21	42
7′– 6″	1′– 5 9/32″	5′– 7 9/32″	..	21	24	45
8′– 0″	1′– 6 13/32″	5′–11 3/4″	..	21	27	48
8′– 6″	1′– 7 9/16″	6′– 4 1/4″	..	21	29	50
9′– 0″	1′– 8 23/32″	6′– 8 23/32″	..	21	32	53
9′– 6″	1′– 9 7/8″	7′– 1 7/32″	..	21	35	56
10′– 0″	1′–11 1/32″	7′– 5 11/16″	..	21	37	58

This table applies to 9x4½x2½, 9x6¾x2½ and 9x9x2½-inch Series Wedge Brick

BRICK FOR ARCHES OF VARIOUS RISES AND SPANS

12-INCH ARCH THICKNESS—1.608-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Wedge	No. 1 Wedge	No. 1-X Wedge	Total
8′– 0″	1′– 0 7/8″	8′–0″	13	25	..	38
8′– 6″	1′– 1 21/32″	8′–6″	11	29	..	40
9′– 0″	1′– 2 15/32″	9′–0″	8	34	..	42
9′– 6″	1′– 2 31/32″	9′–6″	6	38	..	44
10′– 0″	1′– 4 1/16″	10′–0″	4	42	..	46
10′– 6″	1′– 4 7/8″	10′–6″	3	46	..	49
11′– 0″	1′– 5 11/16″	11′–0″	..	51	..	51
11′– 6″	1′– 6 1/2″	11′–6″	..	48	5	53
12′– 0″	1′– 7 9/32″	12′–0″	..	46	9	55
12′– 6″	1′– 8 3/32″	12′–6″	..	44	13	57
13′– 0″	1′– 8 29/32″	13′–0″	..	42	17	59
13′– 6″	1′– 9 11/16″	13′–6″	..	40	21	61
14′– 0″	1′–10 1/2″	14′–0″	..	38	25	63
14′– 6″	1′–11 5/16″	14′–6″	..	36	29	65
15′– 0″	2′– 0 1/8″	15′–0″	..	34	33	67
15′– 6″	2′– 0 29/32″	15′–6″	..	32	38	70
16′– 0″	2′– 1 23/32″	16′–0″	..	30	42	72
16′– 6″	2′– 2 17/32″	16′–6″	..	28	46	74
17′– 0″	2′– 3 11/32″	17′–0″	..	25	51	76
18′– 0″	2′– 4 5/16″	18′–0″	..	21	59	80

This table applies to 12x4½x3, 12x6x3 and 12x9x3-inch Series Wedge Brick

13½-INCH ARCH THICKNESS—1.608-INCH RISE PER FOOT OF SPAN

Span	Rise	Inside Radius	NUMBER REQUIRED PER COURSE			
			No. 2 Wedge	No. 1 Wedge	No. 1-X Wedge	Total
8′– 0″	1′– 0 7/8″	8′–0″	19	20	..	39
8′– 6″	1′– 1 21/32″	8′–6″	17	24	..	41
9′– 0″	1′– 2 15/32″	9′–0″	14	29	..	43
9′– 6″	1′– 3 9/32″	9′–6″	12	33	..	45
10′– 0″	1′– 4 1/16″	10′–0″	10	37	..	47
10′– 6″	1′– 4 7/8″	10′–6″	8	41	..	49
11′– 0″	1′– 5 11/16″	11′–0″	6	45	..	51
11′– 6″	1′– 6 1/2″	11′–6″	4	49	..	53
12′– 0″	1′– 7 9/32″	12′–0″	2	53	..	55
12′– 6″	1′– 8 3/32″	12′–6″	..	56	1	57
13′– 0″	1′– 8 29/32″	13′–0″	..	54	6	60
13′– 6″	1′– 9 11/16″	13′–6″	..	52	10	62
14′– 0″	1′–10 1/2″	14′–0″	..	50	14	64
14′– 6″	1′–11 5/16″	14′–6″	..	48	18	66
15′– 0″	2′– 0 1/8″	15′–0″	..	46	22	68
15′– 6″	2′– 0 29/32″	15′–6″	..	44	26	70
16′– 0″	2′– 1 23/32″	16′–0″	..	41	31	72
16′– 6″	2′– 2 17/32″	16′–6″	..	39	35	74
17′– 0″	2′– 3 11/32″	17′–0″	..	37	39	76
17′– 6″	2′– 4 1/8″	17′–6″	..	35	43	78
18′– 0″	2′– 4 5/16″	18′–0″	..	33	48	81

This table applies to 13½x4½x3, 13½x6x3 and 13½x9x3-inch Series Wedge Brick

Tables on this page also applicable to Silica Brick

CIRCUMFERENCES AND AREAS OF CIRCLES

From $\frac{1}{64}$ to 30

Diam.	Circum.	Area	Diam.	Circum.	Area
$\frac{1}{64}$	.04909	.000192	10	31.416	78.54
$\frac{1}{32}$	.09818	.000767	10½	32.9868	86.5903
$\frac{3}{64}$	.19635	.003068			
$\frac{1}{16}$	.3927	.012272	11	34.5576	95.0334
$\frac{3}{32}$	.589	.027612	11½	36.1284	103.8691
$\frac{1}{8}$	.7854	.049087			
$\frac{5}{64}$	.98175	.076699	12	37.6992	113.098
$\frac{3}{16}$	1.1781	.110447	12½	39.27	122.719
$\frac{7}{64}$	1.37445	.15033			
$\frac{1}{4}$	1.5708	.19635	13	40.8408	132.733
$\frac{9}{64}$	1.76715	.248505	13½	42.4116	143.139
$\frac{5}{16}$	1.9635	.306796			
$\frac{11}{64}$	2.15985	.371224	14	43.9824	153.938
$\frac{3}{8}$	2.3562	.441787	14½	45.5532	165.13
$\frac{13}{64}$	2.55255	.518487			
$\frac{7}{16}$	2.7489	.601322	15	47.124	176.715
$\frac{15}{64}$	2.94525	.690292	15½	48.6948	188.692
1	3.1416	.7854			
1¼	3.927	1.2272	16	50.2656	201.062
1½	4.7124	1.7671	16½	51.8364	213.825
1¾	5.4978	2.4053			
2	6.2832	3.1416	17	53.4072	226.981
2¼	7.0686	3.9761	17½	54.978	240.529
2½	7.854	4.9087			
2¾	8.6394	5.9396	18	56.5488	254.47
			18½	58.1196	268.803
3	9.4248	7.0686			
3¼	10.2102	8.2958	19	59.6904	283.529
3½	10.9956	9.6211	19½	61.2612	298.648
3¾	11.781	11.0447			
4	12.5664	12.5664	20	62.832	314.16
4¼	13.3518	14.1863	20½	64.4028	330.064
4½	14.1372	15.9043			
4¾	14.9226	17.7206	21	65.9736	346.361
			21½	67.5444	363.051
5	15.708	19.635			
5¼	16.4934	21.6476	22	69.1152	380.134
5½	17.2788	23.7583	22½	70.686	397.609
5¾	18.0642	25.9673			
			23	72.2568	415.477
6	18.8496	28.2744	23½	73.8276	433.737
6¼	19.635	30.6797			
6½	20.4204	33.1831	24	75.3984	452.39
6¾	21.2058	35.7848	24½	76.9692	471.436
7	21.9912	38.4846	25	78.54	490.875
7¼	22.7766	41.2826	25½	80.1108	510.706
7½	23.562	44.1787			
7¾	24.3474	47.1731	26	81.6816	530.93
			26½	83.2524	551.547
8	25.1328	50.2656			
8¼	25.9182	53.4563	27	84.8232	572.557
8½	26.7036	56.7451	27½	86.394	593.959
8¾	27.489	60.1322			
			28	87.9648	615.754
9	28.2744	63.6174	28½	89.5356	637.941
9¼	29.0598	67.2008			
9½	29.8452	70.8823	29	91.1064	660.521
9¾	30.6306	74.6621	29½	92.6772	683.494

CIRCUMFERENCES AND AREAS OF CIRCLES

From 30 to 100

Diam.	Circum.	Area	Diam.	Circum.	Area
30	94.248	706.86	50	157.08	1963.5
30½	95.8188	730.618	51	160.22	2042.82
			52	163.36	2123.71
31	97.3896	754.769	53	166.50	2206.18
31½	98.9604	779.313	54	169.65	2290.21
32	100.5312	804.25	55	172.79	2375.82
32½	102.102	829.579	56	175.93	2463.01
			57	179.07	2551.75
33	103.673	855.301	58	182.21	2642.08
33½	105.244	881.415	59	185.35	2733.97
34	106.814	907.922	60	188.50	2827.43
34½	108.385	934.822	61	191.64	2922.46
			62	194.78	3019.07
35	109.956	962.115	63	197.92	3117.24
35½	111.527	989.8	64	201.06	3216.99
36	113.098	1017.878	65	204.20	3318.30
36½	114.668	1046.349	66	207.35	3421.18
			67	210.49	3525.65
37	116.239	1075.213	68	213.63	3631.68
37½	117.81	1104.469	69	216.77	3739.28
38	119.381	1134.118	70	219.91	3848.45
38½	120.952	1164.159	71	223.05	3959.19
			72	226.19	4071.50
39	122.522	1194.593	73	229.34	4185.38
39½	124.093	1225.42	74	232.48	4300.84
40	125.664	1256.64	75	235.62	4417.86
40½	127.235	1288.25	76	238.76	4536.45
			77	241.90	4656.62
41	128.806	1320.26	78	245.04	4778.36
41½	130.376	1352.66	79	248.19	4901.66
42	131.947	1385.45	80	251.33	5026.54
42½	133.518	1418.63	81	254.47	5153.00
			82	257.61	5281.01
43	135.089	1452.2	83	260.75	5410.59
43½	136.66	1486.17	84	263.89	5541.77
44	138.23	1520.53	85	267.04	5674.50
44½	139.801	1555.29	86	270.18	5808.80
			87	273.32	5944.67
45	141.372	1590.43	88	276.46	6082.11
45½	142.943	1625.97	89	279.60	6221.13
46	144.514	1661.91	90	282.74	6361.72
46½	146.084	1698.23	91	285.88	6503.87
			92	289.03	6647.61
47	147.655	1734.95	93	292.17	6792.90
47½	149.226	1772.06	94	295.31	6939.78
48	150.797	1809.56	95	298.45	7088.21
48½	152.368	1847.46	96	301.59	7238.23
			97	304.73	7389.81
49	153.938	1885.75	98	307.88	7542.96
49½	155.509	1924.43	99	311.02	7697.68
			100	314.16	7853.97

TABLES OF MENSURATION

To find the circumference of a circle:

Multiply the diameter by 3.1416; or for approximate purposes by 3 1/7.

To find diameter of a circle when the circumference is given:

Divide the circumference by 3.1416; or for approximate purposes multiply the circumference by 7 and divide by 22.

To find the area of a circle:

Multiply the square of the radius by 3.1416.

To find the area of a triangle:

Multiply the base by one-half the perpendicular height

To find the volume of a cylinder:

Multiply the area of the section by the length.

To find the volume of a sphere:

Multiply the cube of the diameter by .5236.

To find the volume of a cone or pyramid:

Multiply the area of the base by 1/3 of the height.

To find the approximate weight of a brick or special shape in pounds:

Multiply the volume in cubic inches by .075.

To find the radius of an arch, when the span and rise are given:

Square the span or chord; divide by 8 times the rise and add ½ the rise.

$$\frac{\text{Span}^2}{8 \times \text{Rise}} + \frac{\text{Rise}}{2} = \text{Radius}$$

To find the rise of an arch, when the span and radius are given:

Square the radius, also square ½ the span; subtract the latter from the former, take the square root of the remainder, and subtract the result from the radius.

$$\text{Radius} - \sqrt{\text{Radius}^2 - \tfrac{1}{2}\,\text{Span}^2} = \text{Rise}$$

To change degrees Centigrade to Fahrenheit:

Multiply by 9, divide by 5 and add 32.

To change degrees Fahrenheit to Centigrade:

Subtract 32, divide by 9 and multiply by 5.

DECIMAL AND METRIC EQUIVALENTS OF COMMON FRACTIONS

(Bureau of Standards)

Fractions of an Inch	Decimals of an Inch	Milli-meters	Milli-meters	Decimals of an Inch	Fractions of an Inch
1/64	.0156	0.397	13.097	.5156	33/64
1/32	.0313	0.794	13.494	.5313	17/32
3/64	.0469	1.191	13.891	.5469	35/64
1/16	.0625	1.588	14.288	.5625	9/16
5/64	.0781	1.985	14.684	.5781	37/64
3/32	.0938	2.381	15.081	.5938	19/32
7/64	.1094	2.778	15.478	.6094	39/64
1/8	.1250	3.175	15.875	.6250	5/8
9/64	.1406	3.572	16.272	.6406	41/64
5/32	.1563	3.969	16.669	.6563	21/32
11/64	.1719	4.366	17.066	.6719	43/64
3/16	.1875	4.763	17.463	.6875	11/16
13/64	.2031	5.159	17.859	.7031	45/64
7/32	.2188	5.556	18.256	.7188	23/32
15/64	.2344	5.953	18.653	.7344	47/64
1/4	.2500	6.350	19.050	.7500	3/4
17/64	.2656	6.747	19.447	.7656	49/64
9/32	.2813	7.144	19.844	.7813	25/32
19/64	.2969	7.541	20.241	.7969	51/64
5/16	.3125	7.938	20.638	.8125	13/16
21/64	.3281	8.334	21.034	.8281	53/64
11/32	.3438	8.731	21.431	.8438	27/32
23/64	.3594	9.128	21.828	.8594	55/64
3/8	.3750	9.525	22.225	.8750	7/8
25/64	.3906	9.922	22.622	.8906	57/64
13/32	.4063	10.319	23.019	.9063	29/32
27/64	.4219	10.716	23.416	.9219	59/64
7/16	.4375	11.113	23.813	.9375	15/16
29/64	.4531	11.509	24.209	.9531	61/64
15/32	.4688	11.906	24.606	.9688	31/32
31/64	.4844	12.303	25.003	.9844	63/64
1/2	.5000	12.700	25.400	1.0000	1

PYROMETRIC CONES AND "P. C. E."

● The term "fusion point" is widely used to indicate the temperature at which a fire clay changes from a solid to a liquid state, through the application of heat. It is misleading, as most refractories soften gradually through a wide temperature range and therefore have no definite point of fusion. The term "fusion point" is being replaced by the term "P. C. E." (Pyrometric Cone Equivalent.)

SOFTENING POINTS OF PYROMETRIC CONES

DEFINITION: Pyrometric Cone Equivalent (P. C. E.)—In the case of refractories, the number of that standard cone whose tip would touch the supporting plaque simultaneously with a cone of the material being investigated when tested in accordance with the Standard Method of Test for P. C. E. of Fireclay Brick (A. S. T. M. Designation C-24) of the American Society for Testing Materials.

No. of Cone	End Point*		No. of Cone	End Point*	
	Degrees Cent.	Degrees Fahr.		Degrees Cent.	Degrees Fahr.
022	605	1121	7	1250	2282
021	615	1139	8	1260	2300
020	650	1202	9	1285	2345
019	660	1220	10	1305	2381
018	720	1328	11	1325	2417
017	770	1418	12	1335	2435
016	795	1463	13	1350	2462
015	805	1481	14	1400	2552
014	830	1526	15	1435	2615
013	860	1580	16	1465	2669
012	875	1607	17	1475	2687
011	905	1661	18	1490	2714
010	895	1643	19	1520	2768
09	930	1706	20	1530	2786
08	950	1742	23	1580	2876
07	990	1814	26	1595	2903
06	1015	1859	27	1605	2921
05	1040	1904	28	1615	2939
04	1060	1940	29	1640	2984
03	1115	2039	30	1650	3002
02	1125	2057	31	1680	3056
01	1145	2093	32	1700	3092
1	1160	2120	†32½	**1722**	**3131**
2	1165	2129	33	1745	3173
3	1170	2138	34	1760	3200
			35	1785	3245
4	1190	2174	36	1810	3290
5	1205	2201	37	1820	3308
6	1230	2246	38	1835	3335

*NOTE: Pyrometric cones do not give an accurate measurement of temperature. Where it is desired to interpret P. C. E. values approximately in terms of temperature, the table above may be used. This table has been approved by the A. S. T. M. It is based on the work of Fairchild and Peters. J. Amer. Cer. Soc. 9, 701-43, 1926. Heating rate 150° Cent. per hour for cones .022 to 20, inclusive, and 100° Cent. per hour for cones 23 to 38, inclusive. The temperature do not apply to the slower rates of heating common in the commercial firing and the use of refractory materials.

†Not included in the tests of Fairchild and Peters. The temperatures given are approximate.

APPROXIMATE RANGE OF FURNACE TEMPERATURES

Kind of Equipment	Degrees Centigrade	Degrees Fahrenheit
AIR FURNACES, Malleable Iron	1600-1675	2900-3100
BESSEMER CONVERTERS		
Steel running into ladles	1600	2900
Steel running into molds	1575	2850
BLAST FURNACES, Iron		
Front at tuyere	1550-1900	2800-3500
Iron at tapping	1370-1500	2500-2800
BY-PRODUCT COKE OVENS	1000-1500	1850-2750
BOILERS	1200-1600	2200-2900
CEMENT KILNS, hot zone	1325-1600	2400-2900
COPPER CONVERTERS	1200-1300	2200-2400
COPPER REVERBERATORIES	1300-1600	2400-2850
GAS PRODUCERS, combustion zone	1250-1375	2300-2500
GLASS POT FURNACES	1260-1370	2300-2500
GLASS TANKS, flat glass	1375-1650	2500-3000
GLASS TANKS, bottles	1375-1600	2500-2900
LEAD BLAST FURNACES	900-1200	1650-2200
LEAD REFINING FURNACES	975-1100	1800-2000
OPEN HEARTH FURNACES		
Gas entering regenerator	600-850	1200-1600
Gas leaving regenerator	1100-1200	2000-2250
Air leaving regenerator	1000-1150	1850-2100
Waste gases entering gas chamber	1350-1400	2450-2550
Waste gases entering stack	625-675	1150-1250
Refining the steel	1575-1700	2900-3100
Running into ladles	1575-1625	2875-2950
Ingots in soaking pits	1225-1300	2250-2350
Slabs and billets in reheating furnaces	1100-1300	2000-2350

COLOR SCALE FOR TEMPERATURES

Color	Degrees Centigrade	Degrees Fahrenheit
Lowest visible red	475	875
Lowest visible red to dark red	475 to 650	875 to 1200
Dark red to cherry red	650 to 750	1200 to 1375
Cherry red to bright cherry red	750 to 825	1375 to 1500
Bright cherry red to orange	825 to 900	1500 to 1650
Orange to yellow	900 to 1090	1650 to 2000
Yellow to light yellow	1090 to 1320	2000 to 2400
Light yellow to white	1320 to 1540	2400 to 2800
White to dazzling white	1540 and over	2800 and over

HEAT LOSS AND HEAT STORAGE TABLES

(Based on still air at 70° F)
Heat Storage Capacities in B. T. U.'s per sq. ft.
Heat Losses in B. T. U.'s per sq. ft. per hour
Hot face Temperature in degrees fahrenheit

FOR VARIOUS WALL STRUCTURES AT FURNACE EQUILIBRIUM

Various Types of Walls	1200°		1400°		1600°		1800°		2000°		2200°		2400°		2600°	
	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage	Heat Loss	Heat Storage
4½" Firebrick	1278	7953	1584	9562	1918	10812	2328	12370	2720	13770	3133	15170	3556	16670	4070	18070
4½" M-26 Insulating Firebrick	439	2413	545	2839	659	3285	781	3744	910	4222	1047	4696	1193	5174	1348	5657
4½" M-26 + 1" Block Insulation	220	3635	277	4328	339	5030	407	5760	479	6494	555	7250	639	8023	729	8808
4½" M-26 + 1½" Block Insulation	179	3944	225	4692	277	5469	332	6262	393	7065	457	7888	526	8727	599	9578
6" Firebrick	1010	10242	1244	12121	1502	13976	1779	15848	2063	17768	2359	19703	2667	21638	2985	23573
6" M-26 Insulating Firebrick	338	3111	419	3684	505	4279	598	4877	697	5492	801	6112	911	6742	1029	7384
6" M-26 + 1" Block Insulation	189	4563	239	5468	290	6322	348	7230	409	8155	475	9102	547	10066	619	11047
6" M-26 + 1½" Block Insulation	158	4944	199	5867	243	6830	291	7797	343	8818	399	9878	459	10909	523	11919
9" Firebrick	717	14561	882	17245	1055	20102	1243	22798	1443	25594	1653	28345	1869	31234	2101	24110
9" M-26 Insulating Firebrick	232	4528	286	5371	345	6236	408	7114	474	8007	543	8910	621	9823	699	10758
4½" Firebrick + 4½" M-26	347	13273	427	15827	514	18455	607	21145	705	23893	809	26702	919	29579	1035	32515
13½" Firebrick	504	21056	617	24945	739	28868	865	32890	998	36979	1140	41135	1289	45291	1447	49422
13½" M-26 Insulating Firebrick	158	6643	195	7873	235	9129	277	10444	322	11729	370	13056	420	14409	473	15765
9" Firebrick + 4½" M-26	286	22736	353	27121	422	31644	498	36205	576	40987	661	45780	748	50768	842	55795
18" Firebrick	388	27369	476	32399	568	37573	666	42770	768	48072	875	43436	987	58910	1106	64470
18" M-26 Insulating Firebrick	120	8717	145	10368	178	12032	210	13723	244	15433	280	17161	318	18939	358	20736

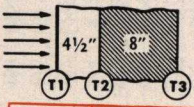
FOR VARIOUS THICKNESSES AT FURNACE EQUILIBRIUM

Thickness	TYPE OF WALL	1200°			1400°			1600°			1800°			2000°			2200°			2400°		
		Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage	Outside Wall Temp.	Heat Loss	Heat Storage
2½ inches	M-26	322	741	1352	363	920	1604	402	1116	1856	438	1329	2111	473	1556	2370	508	1800	2630	475	2061	2893
	I. R. C.	399	1101	2228	444	1376	2625	490	1665	3034	534	1980	3447									
	Furnas-Crete	485	1635	3649	544	2037	4307															
	Mono-Fibrik	527	1927	4623																		
	Firebrick	538	2005	4900																		
4½ inches	M-26	245	440	2413	272	546	2839	302	658	3285	332	780	3744	362	910	4222	388	1051	4696	405	1198	5174
	I. R. C.	306	673	3762	342	830	4426	378	997	5132	412	1178	5833	445	1371	6550	477	1572	7272			
	Furnas-Crete	382	1019	6109	426	1262	7211	471	1546	8332	510	1806	9456	550	2100	10600	588	2400	11764	625	2710	12948
	Mono-Fibrik	420	1221	7721	467	1519	9107	513	1829	10514	558	2222	12070	601	2592	13420	642	2983	14820	681	3384	16310
	Firebrick	428	1270	7953	477	1581	9562	525	1915	10812	572	2328	12370	618	2720	13770	663	3133	15170	707	3556	16670
6¾ inches	M-26	206	309	3328	226	375	3942	250	453	4577	271	534	5215	292	622	5858	315	718	6516	239	816	7190
	I. R. C.	254	469	5383	282	577	6383	310	693	7383	340	816	8426	366	939	9452	395	1086	10512			
	Furnas-Crete	318	725	8736	357	892	10342	393	1073	11960	426	1264	13598	460	1467	15257	492	1682	16930	524	1908	18608
	Mono-Fibrik	353	873	11038	394	1077	13054	932	1298	15067	471	1542	17122	506	1777	19219	542	2036	21286	378	2295	23356
	Firebrick	362	912	11702	402	1126	13825	442	1359	15935	481	1603	18116	518	1858	20336	554	2124	22386	589	2401	24456
9 inches	M-26	178	232	4528	197	288	5371	217	346	6236	236	408	7114	256	475	8007	273	545	8910	293	621	9823
	I. R. C.	222	361	7004	247	443	8297	271	533	9620	295	627	10962	318	728	12321	344	832	13695			
	Furnas-Crete	278	566	11271	310	694	13366	343	830	15504	375	975	17654	404	1130	19823	432	1295	21999	460	1466	24231
	Mono-Fibrik	306	673	14233	345	841	16848	381	1008	19522	414	1186	22188	445	1373	24888	476	1573	27611	505	1786	30356
	Firebrick	316	717	14561	354	879	17245	390	1055	20102	424	1243	22798	456	1441	25594	488	1651	28345	520	1870	31234

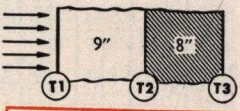
TEMPERATURE GRADIENTS THROUGH REFRACTORY WALLS

MEX-R-CO FIREBRICK | M-26 INSULATING FIREBRICK | MONO-FIBRIK PLASTIC FIREBRICK | RED BRICK

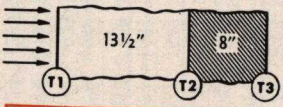
(Q=Heat Loss BTU/Sq. ft./hour; still Air at 70°F)



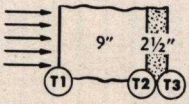
T1 °F	T2 °F	T3 °F	Q
2400	1853	426	1229
2200	1706	403	1112
2000	1549	376	981
1800	1391	346	844
1600	1237	317	715
1400	1082	287	597
1200	927	257	485



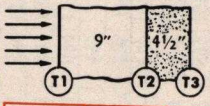
T1 °F	T2 °F	T3 °F	Q
2800	1799	419	1218
2600	1668	396	1089
2400	1537	372	970
2200	1408	349	860
2000	1279	325	751
1800	1151	299	648
1600	1022	275	553



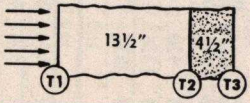
T1 °F	T2 °F	T3 °F	Q
2800	1551	376	983
2600	1438	355	884
2400	1326	331	788
2200	1218	311	694
2000	1104	292	609
1800	991	269	527
1600	880	248	450



T1 °F	T2 °F	T3 °F	Q
2800	1745	431	1275
2600	1620	406	1142
2400	1496	381	1018
2200	1372	356	893
2000	1243	330	783
1800	1123	308	673
1600	1000	272	576



T1 °F	T2 °F	T3 °F	Q
2800	2044	366	937
2600	1898	346	842
2400	1751	324	748
2200	1605	303	661
2000	1458	282	576
1800	1312	261	498
1600	1166	240	422

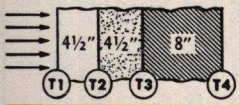


T1 °F	T2 °F	T3 °F	Q
2800	1818	335	797
2600	1687	316	715
2400	1556	297	637
2200	1424	278	563
2000	1297	260	493
1800	1166	242	423
1600	1033	223	362

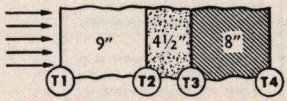
TEMPERATURE GRADIENTS THROUGH REFRACTORY WALLS

MEX-R-CO FIREBRICK | M-26 INSULATING FIREBRICK | MONO-FIBRIK PLASTIC FIREBRICK | RED BRICK

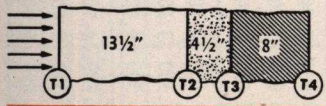
(Q=Heat Loss BTU/Sq. ft./hour; still Air at 70° F.)



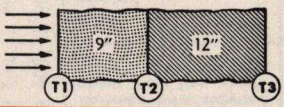
T1 °F	T2 °F	T3 °F	T4 °F	Q
2400	2132	1150	297	646
2200	1956	1048	278	567
2000	1777	946	259	494
1800	1598	848	240	424
1600	1422	749	222	361
1400	1243	654	202	301
1200	1065	559	183	245



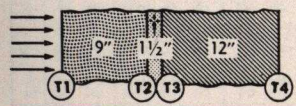
T1 °F	T2 °F	T3 °F	T4 °F	Q
2800	2246	1213	313	706
2600	2091	1126	295	624
2400	1928	1033	276	557
2200	1766	940	258	490
2000	1607	851	241	428
1800	1444	763	224	369
1600	1282	676	207	314



T1 °F	T2 °F	T3 °F	T4 °F	Q
2800	2064	1108	290	613
2600	1916	1028	274	550
2400	1766	939	257	492
2200	1618	857	242	432
2000	1468	776	227	378
1800	1320	694	212	326
1600	1172	617	197	278

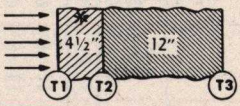


T1 °F	T2 °F	T3 °F	Q
2600	1845	353	875
2400	1686	330	775
2200	1546	307	683
2000	1404	286	598
1800	1263	265	515
1600	1120	245	440
1400	981	223	367



T1 °F	T2 °F	T3 °F	T4 °F	Q
2200	1839	1028	231	390
2000	1674	926	216	338
1800	1518	818	198	288
1600	1344	720	183	242
1400	1180	619	167	198
1200	1024	526	152	159

(†) Block Insulation.



T1 °F	T2 °F	T3 °F	Q
2200	1738	337	803
2000	1580	313	701
1800	1418	289	607
1600	1256	265	512
1400	1102	241	428
1200	945	217	349

(*) First Quality Castable Refractory

SETTING DATA FOR H. R. T. BOILERS WITH FLUSH FRONTS

Diameter of Boiler	Length of boiler over-all	Size of smoke opening	Floor line to top of grates	Top of grates to underside of boiler	Width of grates	Length of grates	Length of boiler setting	Width of boiler setting	Top of bridge wall to underside of boiler	Center to center of boilers in battery	Thickness of center wall at bottom	Common brick required above floor line, single boiler	Number of firebrick required	For Plastic lining—number of pounds of MONOFIBRIK for lining tapering from 9" to 5"	Additional common brick per foot of boiler length	Additional firebrick per foot of boiler length	Common brick for each boiler set in battery after first boiler	Additional Common Brick, each boiler set in battery after first per foot of lgth.	Lb. approximate weight bare boiler	Lb. additional weight of bare boiler for each foot of tube length	Lb. approximate weight, boiler complete with castings and trimmings
In.	Ft.	In. x In.	In.	In.	In.	In.	Ft.-In.	Ft.-In.	In.	Ft.-In.	In.										
36	8	7 x32	24	28	36	30	11– 8	6– 0	14	4–10	22	5,900	1,300	7,900	350	75	3,800	175	3,100	350	5,800
42	10	8 x36	24	28	42	36	13– 8	6– 6	14	5– 4	22	6,600	1,600	9,700	350	75	4,200	175	4,600	400	7,600
48	12	9½x40	24	30	48	42	16– 0	7– 6	16	6– 0	24	9,000	2,000	12,200	425	90	4,800	190	6,600	475	10,600
54	15	10½x42	24	32	54	54	19– 1	8– 0	16	6– 6	24	10,900	2,400	14,600	450	90	5,900	190	8,600	525	13,500
60	16	11½x46	24	34	60	54	20– 3	8– 6	18	7– 2	26	12,100	2,800	17,000	475	100	7,800	250	12,200	660	17,200
66	16	12½x52	26	38	66	60	20– 6	9– 0	21	7– 8	26	14,100	3,200	19,400	500	110	8,700	270	15,600	850	21,700
72	18	13½x58	26	42	72	66	22– 7	9– 6	24	8– 2	26	16,300	3,700	22,400	525	120	10,400	280	20,700	1,000	27,700
78	18	14 x66	26	44	78	72	22– 7	10– 0	26	8– 8	26	17,300	4,000	24,200	550	125	11,000	290	23,800	1,170	32,300
84	18	15½x68	27	46	84	78	22–10	10– 6	28	9– 2	26	18,700	4,300	26,200	575	135	12,000	300	28,600	1,400	36,200
90	20	17½x78	27	48	90	84	25– 0	11– 0	30	9– 8	26	21,300	4,800	29,200	600	140	13,800	310	36,400	1,650	47,400
96	20	18½x82	27	48	96	96	25– 0	11– 6	30	10– 2	26	22,000	5,000	30,300	625	145	14,400	320	43,400	1,900	55,000

SETTING DATA FOR WATER TUBE BOILERS

Heating Surface	Tubes Wide	Depth of Setting		Width of Setting		Width of Furnace	Center Front Drum to Center Rear Drum		Center Top Front Drum to Center Rear Drum		Floor Line to Center Bottom Drum		Length of Grates	Over-all Height of Setting at Front	
				Single Boiler	Two Boilers in Battery										
Sq. Ft.		Ft.	In.	Ft.	Ft.	Ft.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	Ft.	In.
714	6	15	2	6	11	3	9	6	7	0	5	2	6	14	5½
952	8	15	2	7	13	4	9	6	7	0	5	2	6	14	5½
1190	10	15	2	8	15	5	9	6	7	0	5	2	6	14	5½
1428	12	15	2	9	17	6	9	6	7	0	5	2	6	14	5½
1666	14	15	2	10	19	7	9	6	7	0	5	2	6	14	5½
1904	16	15	2	11	21	8	9	6	7	0	5	2	6	14	5½
2142	18	15	2	12	23	9	9	6	7	0	5	2	6	14	5½
2380	20	15	2	13	25	10	9	6	7	0	5	2	6	14	5½
900	6	17	8	6	11	3	12	0	7	4¼	4	9¾	7	14	5½
1800	12	17	8	9	17	6	12	0	7	4¼	4	9¾	7	14	5½
2700	18	17	8	12	23	9	12	0	7	4¼	4	9¾	7	14	5½
3000	20	17	8	13	25	10	12	0	7	4¼	4	9¾	7	14	5½
1086	6	20	2	6	11	3	14	6	7	8½	4	5½	8	14	5½
2172	12	20	2	9	17	6	14	6	7	8½	4	5½	8	14	5½
3258	18	20	2	12	23	9	14	6	7	8½	4	5½	8	14	5½
3620	20	20	2	13	25	10	14	6	7	8½	4	5½	8	14	5½
3982	22	20	2	14	27	11	14	6	7	8½	4	5½	8	14	5½
4344	24	20	2	15	29	12	14	6	7	8½	4	5½	8	14	5½
1690	8	22	8	7	13	4	17	0	8	3¾	4	1¼	8	14	11
2113	10	22	8	8	15	5	17	0	8	3¾	4	1¼	8	14	11
2958	14	22	8	10	19	7	17	0	8	3¾	4	1¼	8	14	11
3381	16	22	8	11	21	8	17	0	8	3¾	4	1¼	8	14	11
4226	20	22	8	13	25	10	17	0	8	3¾	4	1¼	8	14	11
5071	24	22	8	15	29	12	17	0	8	3¾	4	1¼	8	14	11

★ WEIGHTS OF REFRACTORY AND INSULATING MATERIALS ★

MATERIAL	Average Weight In Pounds Per Cubic Foot
FIRECLAY BRICK	
Hand Made	110-125
Stiff Mud Repressed	135-140
Dry Pressed	130-145
FIRECLAY MATERIALS	
Grog	75- 85
Dry Milled Clay	75- 80
Grog-Re-Gate	130-135
Pulverized Grog	80- 85*
Pulverized Clay	70- 75*
Pulverized Diaspore	85- 90*
HIGH ALUMINA BRICK	130-135
INSULATING FIREBRICK	
2600 degree	40- 45
2300 degree	38- 43
2000 degree	35- 40

MATERIAL	Average Weight In Pounds Per Cubic Foot
VAN DYKE SILICA BRICK	100-112
SPECIALTY PRODUCTS	
MONO-FIBRIK	130-135
FURNAS-CRETE	108-114
BAFFLE CRETE	105-110
I-R-C	78- 80
I-R-C 20	48- 52
HILOSET	325-375**
BOND SET	375-425**
LO-SET	325-375**
HY-SET	325-375**
SPRAY MIX	120-125
HELSPOT	128-133
CHROME MATERIALS	
HILO-CHROME (wet)	400-450**
HILO-CHROME (dry)	375-400**
CHROME CONCRETE	190
MONO-CHROME	195-200***

(*)These Materials poured loosely into cube. If shaken down they probably would weight about 20% more. (**)These weights represent the average amount of mortar required to lay up 1,000 firebrick. (***)Weight when pounded in place and dried.

★ WEIGHTS OF MISCELLANEOUS BUILDING MATERIALS ★

MATERIAL	Average Per Cubic Foot In Pounds
BRICK	
Common	100
CEMENTS	
Portland	94.6
Hydraulic	60
FINE GROUND CLAYS, SILICA CEMENT, ETC.	
Fire clay	85
Silica cement	75
Magnesia cement	127
Chrome cement	135
Grain magnesite (as shipped)	112
COAL AND COKE	
Anthracite	60
Bituminous	49
Charcoal	18.5
Coke	26.3
CONCRETE	
Cement, fine	137
Rubble, coarse	119
EARTH	
Loam, dry, loose	76
Loam, packed	95
Loam, soft, loose mud	108
Loam, dense mud	125
LIME	
Quick, loose lumps	53
Quick, fine	75
Stone, large rocks	168
Stone, irregular lumps	96

MATERIAL	Average Per Cubic Foot In Pounds
MASONRY	
Granite or limestone	165
Mortar, rubble	154
Dry	138
Sandstone, dressed	144
METALS	
Aluminum	166
Brass, cast	524
Bronze	534
Copper, cast	537
Copper, rolled or wire	555
Iron, cast	450
Iron, wrought	482
Lead, cast	708
Lead, rolled	711
Steel, cast	490
Steel, rolled	495
Tin, cast	459
Zinc, cast	438
OILS	
Engine	55
Crude	48
Petroleum	55
Gasoline	43
ROCKS	
Chalk	145
Granite	165
Gypsum	143
Sandstone	144
Pumice Stone	57
Quartz	165
Salt, coarse	45
Salt, fine	49
Shales	162
Slate, American	175

MATERIAL	Average Per Cubic Foot In Pounds
SAND	
Dry and loose	100
Dry and packed	110
Wet and packed	130
Gravel packed	118
WATER	
Water as ice	58.7
Water at 32 degrees Fahrenheit	62.4
Water at 212 degrees Fahrenheit	59.6
WOODS, DRY	
Apple	48
Beech	43
Birch	45
Cedar, American	35
Chestnut	41
Ebony	76
Elm	35
Hemlock	25
Hickory	53
Ironwood	114
Mahogany	35 to 53
Maple	49
Oak, live	59
Oak, white	50
Pine, white	25
Pine, yellow northern	34
Pine, yellow southern	45
Spruce	25
Black Walnut	35

ESTIMATING DATA

STANDARD 9" x 4½" x 2½" SERIES

1 square foot of brickwork requires the following number of 9-inch straight firebrick:

2½" thick	3.6	9" thick (*)	14.1
4½" thick	6.4	13½" thick	19.2
4½" thick (*)	7.7	13½" thick (*)	20.5
5" thick	7.2	18" thick	25.6
7½" thick	10.8	22½" thick	32.
9" thick	12.8	27" thick	38.4

(*) Headers every 5th course.

1 cubic foot of brickwork requires seventeen (17.07) 9-inch straight brick in 2½-inch series and fourteen (14.2) in 3-inch series.

1 standard 9" straight firebrick weighs approximately 7.6 to 8.4 pounds.

1 cubic foot of fireclay brick weighs 130 to 140 pounds.

1 cubic foot of silica brick weighs 105 to 120 pounds.

1000 9-inch straight firebrick, closely stacked, in 2½" series will occupy approximately 60 cubic feet; in the 3-inch series, approximately 72 cubic feet.

BONDING MORTAR

From 350 to 400 pounds of wet-type, machine-mixed mortars will be needed to lay-up 1000 firebrick, depending upon the uniformity of the brick. For dry mortars, to be mixed on the job, 300 to 350 pounds are required to lay-up 1000 firebrick.

PLASTIC FIREBRICK

PRODUCT	Pounds of Material per Square Foot of Walls of Thicknesses Shown Below										Wt. per Cu. Ft.
	1"	2"	3"	4"	4½"	5"	6"	7"	8"	9"	
MONO-FIBRIK	11	22	33	44	50	55	67	78	89	100	133⅓
SUPER MONO-FIBRIK	11	22	33	44	50	55	67	78	89	100	133⅓
HELSPOT	11	22	33	44	50	55	67	78	89	100	133⅓

CASTABLE REFRACTORIES

PRODUCT	Pounds of Material per Square Foot of Walls of Thicknesses Shown Below										Wt. per Cu Ft.
	1"	2"	3"	4"	4½"	5"	6"	7"	8"	9"	
FURNAS-CRETE	9	18	27	36	41	45	54	63	72	81	108
SUPER FURNAS-CRETE	11	21	32	42	47	53	63	74	84	95	126
BAFFLE CRETE	9	18	27	36	41	45	54	63	72	81	108
I-R-C	7	13	20	27	30	33	40	47	53	60	80
I-R-C 20	4	8	12	16	18	20	24	28	32	36	48
MEXICAST	9	18	27	36	41	45	54	63	72	81	108

GUIDE FOR SELECTION OF "BETTER REFRACTORIES"

OPERATING CONDITIONS TO BE MET

SLAG

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Composition and viscosity of slags. Reduction and oxidation. Flame impingement. Concentration and renewal of slag. Insulation of refractory. Material and thickness of joints.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Low porosity. High density. Low permeability. Low shrinkage. Mineral balance to resist chemical solution. Good bond.

FUSION

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Temperature. Oxidizing and reducing conditions. Impingement of flame. Insulation of refractory. Static pressure of furnace gases.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Low impurities. High P.C.E. Mineral composition.

SPALLING

Thermal

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Rapidity and range of temperature changes. Contamination by slags and fluxes. Tightness of joints. Previous vitrification.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Elasticity through skeletal grain structure with adequate bond. Moderate-to-high porosity. Low rate of reversible thermal expansion. Moderate thermal conductivity.

Mechanical

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Abuse in removing clinker. Unequal and excessive stresses in masonry. Pinching. No provision for expansion. Too rapid drying of wet refractories.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

High mechanical strength. Toughness. Accuracy of shape.

Structural

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Slags and fluxes. Material in joints. Insulation of refractory.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Low vitrification. Degree of burn. Compact internal structure. Good bond. Moderate porosity.

STRENGTH REDUCTION

Stresses

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Stresses. Temperature gradient in brick. Slags and fluxes. Material in joints. Thickness of joints.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Moderate-to-high density. Hard burn. Compact internal structure. Strong bond.

Disintegration

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Composition of furnace gases. Intermittent firing. Tightness of joints.

PROPERTIES REQUIRED TO COUNTERACT CONDITION

Low iron oxide. Medium-to-small grain size. Low porosity. Low permeability. Hard burn.

ABRASION

DESTRUCTIVE CONDITIONS ENCOUNTERED IN SERVICE

Pressure, area, speed, and angle of impact of abrading material. Thickness of joints. Velocity, amount and character of solids in gases.

PROPERTIES REQUIRED TO COUNTERACT CONDITIONS

Hard. Tough. Strong bond. High density.

CONFINEMENT OF HEAT

Transfer

GOVERNING CONDITIONS ENCOUNTERED IN SERVICE

Heat loss on outer side of refractory . . . function of the thickness of the wall, conduction, convection, radiation. Tightness of walls and pressure of furnace gases.

PROPERTIES TO CONTROL OPERATING RESULTS

Heat transfer as affected by conductivity, porosity, permeability, construction.

Capacity

GOVERNING CONDITIONS ENCOUNTERED IN SERVICE

Temperature and time. Frequency of cooling cycles.

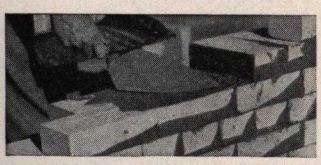
PROPERTIES TO CONTROL OPERATING RESULTS

Specific heat and bulk density of refractory. .

APPLICATION OF REFRACTORIES

The principal objective in the correct laying of firebrick is to obtain a strong, solid wall or arch. Experience has proved best results are obtained when brick are laid with the thinnest possible joint. It is recommended brick be dipped in high temperature bonding mortar and laid with a thin brick-to-brick joint. The result will be a monolithic-like structure possessing great strength. Furnace walls must be air- and gas-tight for efficient operation. This means there must be a minimum of open joints, and to accomplish this, all joints must be staggered so that vertical joints do not fall above another.

HOW TO LAY FIREBRICK PROPERLY



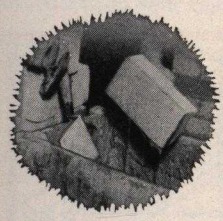
First, trowel a thin "cushion" of high temperature mortar on area where brick are to be laid.

Second, trowel or dip all contact surfaces of brick and lay in place with sliding motion.

Then tamp firmly into place . . . both vertically and horizontally.

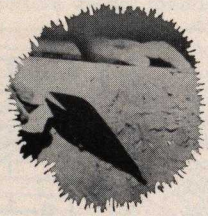
As the final step in the process:
Trowel excess high temperature mortar over face of wall, filling in joints to afford additional protection to edges and corners of the brick during service.—This will prolong firebrick life.

DIPPING



For dipping add only water to HILOSET, stir to thick creamy consistency; dip brick, tap firmly in place; 350 to 400 lbs. mortar required to lay 1000 brick.

TROWELING



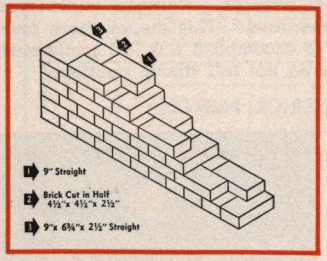
Use High Temperature Bonding Mortar direct from drum for troweling and pointing-up joints, filling voids and evening up slightly worn firebrick surfaces.

SURFACING

Use mixture of six parts of HILOSET High Temperature Bonding Mortar and one part of water, by volume, to prolong the life of old or new firebrick work.

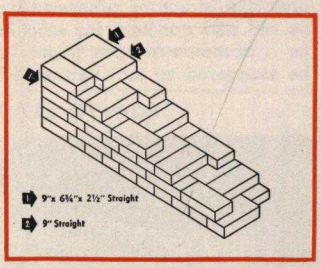
TYPES OF FIREBRICK BONDS

Acceptable procedures in brickwork construction are illustrated, pointing out worthwhile practices that will add to the life of the refractory materials and result in economy and increased efficiency of furnace operation.



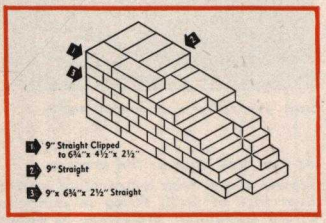
9-inch wall

Lateral strength is achieved by laying this type wall, 9 inches thick, with alternate header and stretcher courses.



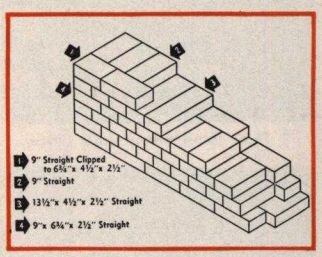
13½-inch wall

The most general method used for laying-up walls 13½ inches thick is the alternate-header-and-stretcher-course.



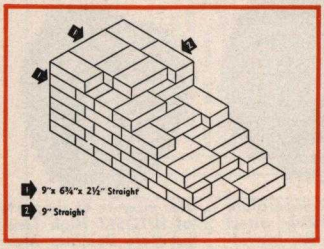
13½-inch wall

This type of construction — 1 course stretcher, 4 courses header—is sometimes preferred. It is easy to repair.



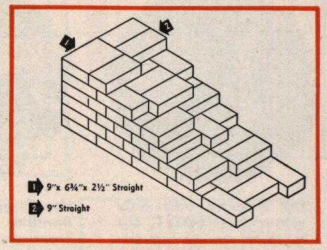
13½-inch wall

An alternate method employs the use of standard 13½" x 4½" x 2½" brick, laid in headers every fifth course.



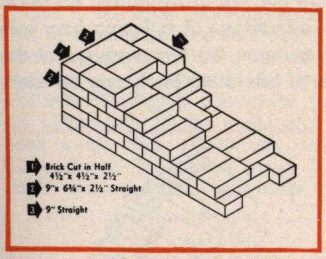
18-inch wall

This bond demonstrates the method of laying alternate header and stretcher courses.



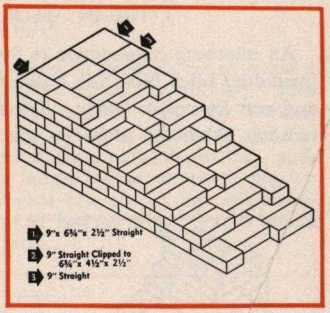
18-inch wall

This style with 3 header courses to each stretcher course is recommended when frequent repair is necessary.



18-inch wall

The above bond features twin 9-inch wall construction, tied together for strength and ease of repair.



22½-inch wall

In high wall construction, this type of all-brick construction is usually preferred.

WALL THICKNESS

For structural stability, walls of only 4½-inch thickness are not suitable for heights greater than 3 feet; it is inadvisable to construct furnace linings of less than 9-inches. It is recommended that 9-inch walls should not be built higher than 8 feet; a wall 13½-inches thick should not be higher than 10 feet; an 18-inch wall may be built up to 26 feet in height, and 22½-inch wall to 35 feet in height.

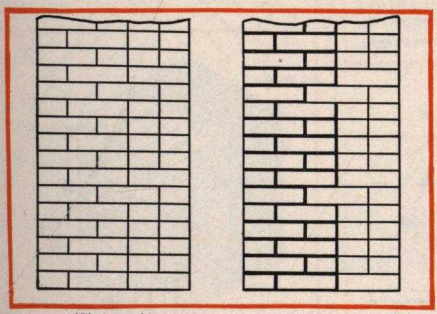
BATTERY SETTINGS

Altough it is preferable that furnaces be set separately, it is sometimes necessary to set them in batteries, utilizing division walls. When it is necessary to construct a division wall between two furnaces the division wall should be built of solid refractories and well bonded together. Battery walls should not be less than 27-inches thick and where they must be heavy-load-bearing-walls a 36-inch thickness is recommended.

TYING-IN WALLS

In solid wall construction, it is sometimes necessary to employ back-up brick for support or additional protection. The most commonly recommended combination is that of high-duty or super-duty firebrick backed-up with intermediate quality firebrick (Figure A). Coefficient of expansion is more nearly identical, and sameness of size simplifies ease of matching joints.

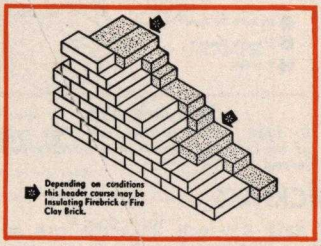
Usually when firebrick and redbrick walls are bonded together, the procedure recommended is a row of headers every fifth course. (See Fig. B) Thicker mortar joints between red brick are necessary.

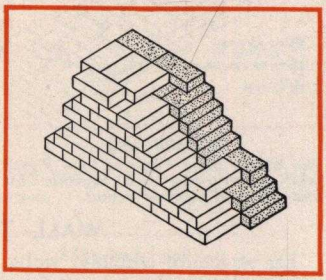


(Figure A) (Figure B)

TYING-IN WITH INSULATING BRICK

An alternate construction is through the use of insulating firebrick. Insulating brick have the additional advantage of reducing heat loss and can be easily tied-in. Depending upon the temperatures of the furnace, either 4½--inches or 9-inches of insulating brick may be used.

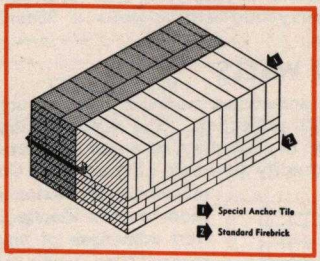




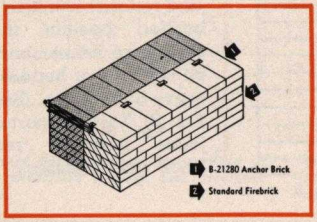
Methods of bonding composite walls of firebrick and insulating brick

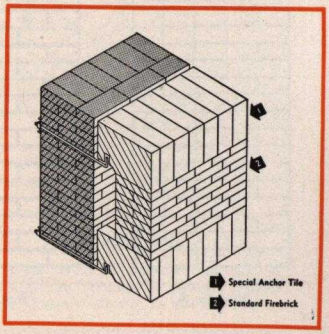
TYPICAL METHODS OF TYING-IN WITH ANCHORS

In certain large construction units, or where expansion and contraction are different between the front and back parts of the wall due to circulating channels or other specialized conditions, it is frequently necessary to build the back part as a separate supporting structure to which the inner lining is tied by special anchor tile.



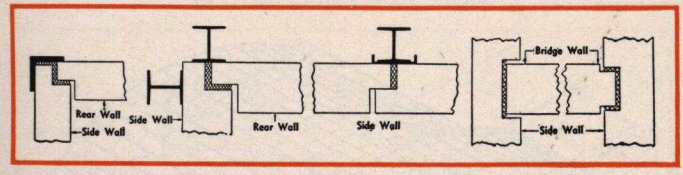
This type of construction permits the inner lining to expand and contract, or to float, so to speak, with respect to the rear part of the wall. Typical methods of installing anchors are shown in figures at left and below.





EXPANSION

One of the most important considerations in firebrick construction is that of expansion and contraction during heating and cooling. Firebrick expand in all three directions when heated—vertically, horizontally along the plane of the wall, and at right angles to it. The methods of making allowance for expansion vary depending upon the dimensions of the walls and the temperatures at which the furnace is operated. Generally, experience has shown that expansion joints should be placed every 10 to 12 feet to avoid forces which might crush the brick or buckle the wall.

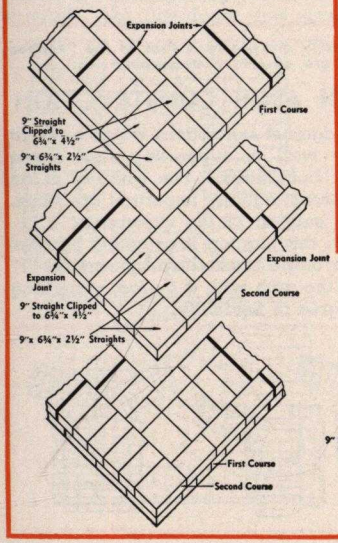


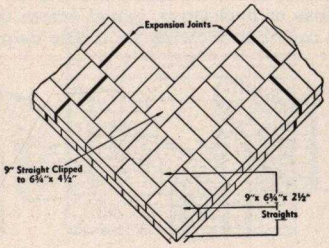
Expansion joints are often packed with various brands of commercial compressible packing. Long fibre soft asbestos rope is generally considered to be most satisfactory but it is imperative that the expansion joints must be kept free of mortar or other material which would prohibit proper functioning of the joint.

In conjunction with proper use of expansion joints, buck-stays prolong furnace life. Where possible, the buck-stays should be placed in back of expansion joints in the sidewalls to hold the packing in the joint and to solidly support the wall on both sides of the joint.

CORNER CONSTRUCTION

In order to facilitate strong corner construction it is often more practical to place expansion joints in the walls adjacent to the corner. Construction shown is header and stretcher (English Bond) type but may be varied to meet the requirements of other types of wall construction.

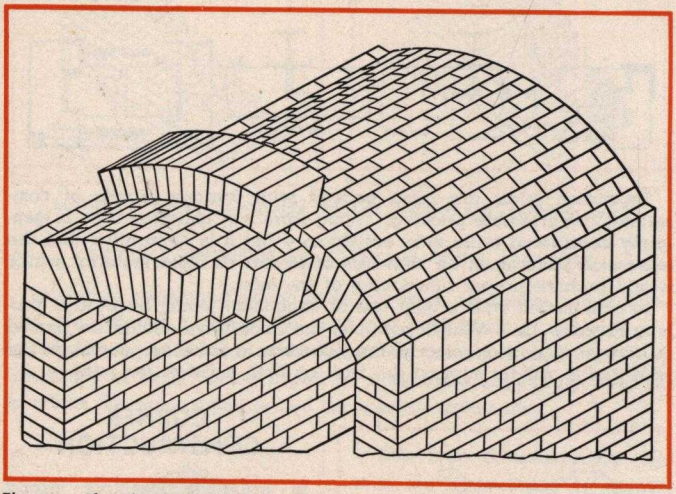




ARCH CONSTRUCTION

The function of an arch in furnace construction is to form roofs of combustion chambers, flues, dutch ovens, incinerators, etc., to span firebox, inspection door and port openings and/or for supporting and relieving the weight of super-structure above the arch. .

In constructing arches facts to be considered are: temperatures to be encountered, width, rise and span, and depth. If a sprung arch is too flat it will produce excessive stress on the arch supports on either end; if it is too steep, the roof will tend to buckle at its crest. *(See pages 74 and 90 for tables showing combinations for achieving various spans.)*

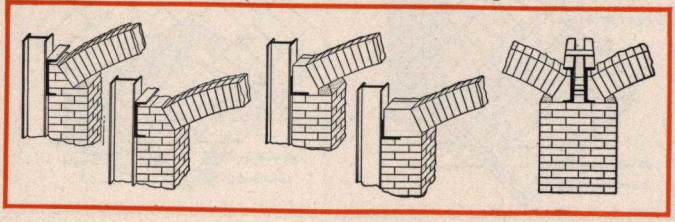


The type of arch construction most generally acceptable is that of the "Bonded Arch" in which the joints are off-set or staggered.

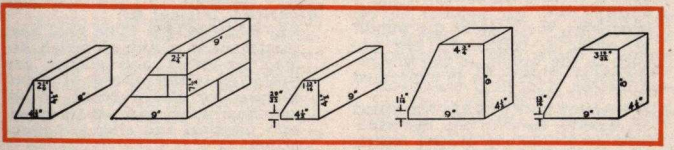
SKEWBACK PLACEMENT IN ARCH CONSTRUCTION

A sprung arch rests at both ends against skewbacks which transmit the arch stresses to the refractory wall or supporting steel frame work, horizontal buttress beams or buck-stays. The stability of an arch depends upon its rise and thickness; equally important are slope, strength, placement, and structural support of the skewbacks.

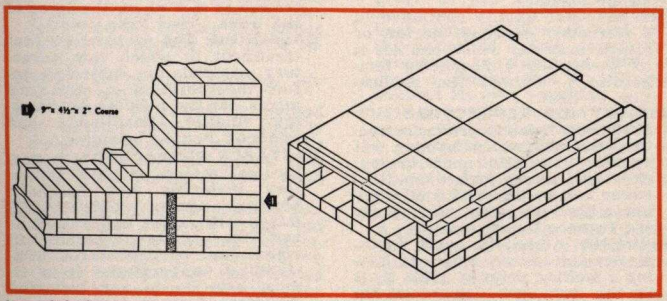
Arches must be rigidly supported: this support is provided by seating the skew in a metal channel or angle backed up by vertical "I" beams or buck-stays, joined across the arch with a tie-rod, stabilizing the arch but allowing for a safe degree of flexibility.



Skewbacks may be built with standard 9-inch series shapes, or they may be supplied as special shapes. The "built-up" skewback is widely favored due to its possible convenience of construction, but the one-piece skewback is stronger and is more generally recommended.



FLOOR CONSTRUCTION

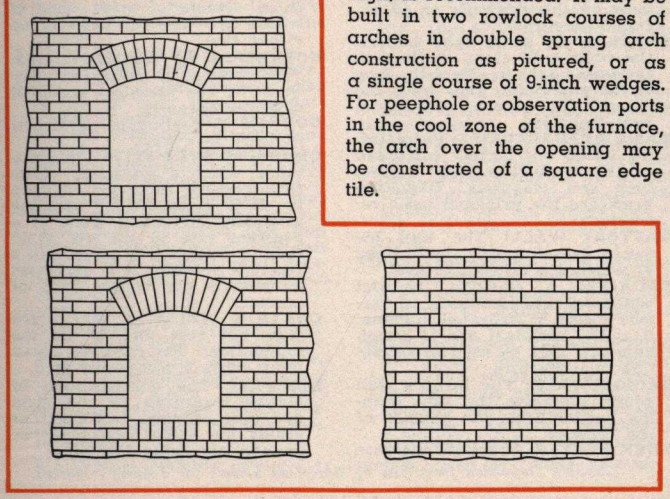


In solid floor construction of oil-or gas-fired boilers, it is necessary to provide an expansion joint to avoid buckling of floor or forcing out the base of the wall.

In air-cooled floor construction it is recommended that the piers be formed with 9-inch firebrick with shiplap tile placed on the piers to form flues.

DOORS AND PORTS

Doors and port openings need not weaken the wall if properly constructed. For fire doors and access doors, a sprung arch, 9-inches high, is recommended. It may be built in two rowlock courses of arches in double sprung arch construction as pictured, or as a single course of 9-inch wedges. For peephole or observation ports in the cool zone of the furnace, the arch over the opening may be constructed of a square edge tile.



GLOSSARY OF TERMS

ABRASION: *Wearing away of refractory surfaces by the scouring action of moving solids.

ABSORPTION: As applied to refractories, the ratio of the weight of water a refractory can absorb to the weight of the dry refractory. The ratio is expressed as a percentage.

AIR HAMMER PROCESS: A method of forming used in the manufacture of refractory shapes which consists of tamping low moisture content mixes in rigid molds with an air hammer.

AIR-SET: The quality contained in a refractory castable, mortar, or plastic material which enables it to harden at atmospheric temperatures, without the application of heat.

AIR SETTING REFRACTORY MORTAR: A finely ground refractory material which forms a wet mortar that will, upon drying, develop a strong air-set bond between refractory brick and maintain a bond when heated to working furnace temperatures.

ALUMINA: Aluminum oxide Al_2O_3. A very refractory compound having a melting point of 3722° F. It is the principal component of diaspore, burley and fireclays.

ANCHOR: A mechanical device made of metal or refractory material inserted between the outer supports and refractory wall, arch or roof for the purpose of securing the furnace lining.

ARCH: The roof of a furnace or kiln, usually in the shape of an arc which rests with its skewback on the sidewalls or on external steelwork.

BAFFLES: In water tube boilers, the walls built along or through the tube banks to direct the flow of hot gases after they leave the furnace, to promote maximum heat transfer.

BASIC REFRACTORIES: Refractories which are largely composed of the chemically basic oxides, lime and magnesia. Magnesite brick are the principal basic refractory.

BATTERY WALL: The wall between two furnaces, both faces of which are exposed to heat.

BAUXITE: A clay-like material which consists essentially of various forms of hydrated alumina. It is the principal ore of aluminum and may be used in refractory manufacture.

BRIDGE WALL: The furnace wall which separates the fuel burning portion from the balance of the furnace.

BUCK STAY: A structural member used to reinforce a wall by taking up the outward thrust of a wall or arch.

BURNING (Firing) OF REFRACTORIES: *The final heat treatment in a kiln to which Refractory brick and shapes are subjected in the process of manufacture for the purpose of developing bond and other necessary physical and chemical properties.

BUTTERED JOINT: In laying up firebrick, a joint formed by troweling mortar on the faces of the brick. (See "Dip Joint".)

CALCINING: The preparatory heat treatment to which raw refractory materials are subjected, before incorporation in refractory mixes, for the purpose of removing volatile constituents and effecting volume changes.

CASTABLE REFRACTORY: A mixture of fireclays, calcined refractory materials and hydraulic bonding agents, which when mixed with water and poured or cast like ordinary concrete will air-set and be capable of withstanding temperatures from atmospheric up to and including moderate furnace temperatures.

CHROME REFRACTORIES: Bonded chromite. May be in the form of fired brick, unburned brick, castables, plastics or ramming mixtures.

CORBEL: In a wall, the projection from the vertical formed by placing each course beyond the course just below.

CORE WALL: In a battery wall those courses of brick, none of which are directly exposed on either side.

CORROSION OF REFRACTORIES: *Destruction of refractory surfaces by the chemical action of external agencies.

COURSE: A continuous, level row of brick in a wall.

CRUSHING STRENGTH: The resistance which a refractory offers to a vertical force placed upon it. It is measured by applying gradually increasing loads at a constant rate to the 4½"x2½" face of a refractory piece until a fracture results. It is expressed in pounds per square inch of surface.

CURTAIN WALL: A wall which does not rest directly on the foundation. For example, a wall built above a suspended arch.

DENSITY: The concentration of matter measured by the mass per unit volume, expressed as grams per cubic centimeter or pounds per cubic foot.

(*) Standard Definition furnished by American Society for Testing Materials.

DIASPORE CLAY: A rock-like mineral consisting essentially of diaspore bonded by fire clay substance. The alumina content is higher than 63%.

DIATOMACEOUS EARTH: Also known as infusorial earth. It is composed of the siliceous skeletons of miscroscopic organisms known as diatoms. This widely distributed material has low density and low thermal conductivity due to the minute cellular structure and high porosity. It is frequently used as a heat insulator.

DIP JOINT: In laying up firebrick, a joint formed by dipping the brick into the mortar and either rubbing or tapping the brick into place.

DOBIE: A crudely formed, unburned brick.

DRY PRESS PROCESS: A method of forming brick from slightly moistened granular materials by feeding the material into a suitable press equipped with mold boxes.

DUTCH OVEN: A combustion furnace built separate from but connected to a working furnace.

EROSION: Wearing away of refractory surfaces by the washing action of moving liquids, molten slags, or gases laden with molten slag particles.

EXPANSION JOINTS: Small spaces or gaps built into furnace walls, roofs or floors to permit sections of masonry to expand and contract freely and to prevent distortion or buckling of furnace structure from excessive expansion stresses. These joints are built in such forms as to permit movement of masonry but prevent air or gas leaks through the masonry.

FIREBRICK: Any brick capable of withstanding high temperature.

FIRECLAY: A sedimentary clay containing only small amounts of fluxing impurities, but high in hydrous aluminum silicates, and therefore capable of withstanding high temperatures. Fireclays have wide variations in chemical and physical properties. They are usually classified as plastic, semi-plastic, semi-flint and flint fireclays ranging from very soft plastic clays to very hard, rock-like clays almost totally devoid of plasticity.

FIRECLAY-PLASTIC REFRACTORY: A fireclay material tempered with water and suitable for ramming into place to form a monolithic furnace lining that will attain satisfactory physical properties when subjected to working furnace temperatures.

FLINT FIRECLAY: *A hard or flint-like fireclay ocurring as an unstratified massive rock, practically devoid of natural plasticity and showing a conchoidal fracture.

FLUX: A material or mixture of materials which causes other compounds with which it comes in contact to fuse at a temperature lower than their normal fusion temperature.

FUSION: The change from a solid to a fluid state resulting from application of heat. In the case of refractories this change does not occur at any specific temperature, but a softening, through heat alone, or through heat and the action of a flux, causes the substance to slump or flow to such a degree that it will not support its own weight.

FUSION POINT (Fusion Temperature): The temperature at which a particular complex mixture of minerals becomes sufficiently fluid to flow under the weight of its own mass.

GANISTER: (Also see "Quartzite".) A common name for true quartzite, which mineral is most commonly used for the manufacture of silica brick.

GROG: Calcined fireclay, or clean broken fireclay brick, ground to suitable fineness. It is added to a refractory batch to reduce shrinkage in drying and firing.

GROUND FIRECLAY: *Fireclay or a mixture of fireclays that have been subjected to no treatment other than grinding, weathering, or both.

HEADER COURSE: A course in which the individual bricks are laid or set on the 4½"x 9" edge with the 4½"x 2½" end of the brick showing in the surface of the wall.

HEAT SET: The hardening of a mortar as a result of the vitrification of part of its constituents.

HEAT SETTING REFRACTORY MORTAR: A mortar in which the bond is developed by heat set. Such mortars contain no air setting ingredients and their cold strength does not exceed that of the clay bond contained in the mass.

HEAT TRANSFER: The transfusion of heat from a body of higher heat content to one of lower heat content by means of radiation, convection or conduction.

HIGH-ALUMINA REFRACTORIES: Refractory products containing 47.5% or more of alumina. Among the materials used in their production are diaspore, bauxite, gibbsite, kyanite, sillimanite, andalusite, and fused alumina.

(*) Standard Definition furnished by American Society for Testing Materials.

HIGH DUTY FIRECLAY BRICK: *A fireclay brick conforming to one of the following requirements—P. C. E. not lower than Cone No. 31-32, or not more than 1.5% deformation in the 2460° F. (1350°C.) load test.

HIGH TEMPERATURE BONDING MORTAR: A finely ground mixture of various refractory materials, as distinguished from simple raw clays, specially compounded to obtain special properties when used as a mortar at high temperature. The two main types are heat setting mortars and air setting mortars.

HYDRAULIC SETTING: A material which hardens or sets as a result of hydration, a chemical action with water.

IGNITION ARCH: A flat or curved refractory roof over a furnace at the point of fuel entrance which promotes ignition by reflection of heat.

INSULATING FIREBRICK: *A firebrick having a low thermal conductivity and a bulk density of less than 70 pounds per cubic foot suitable for lining industrial furnaces.

INTERMEDIATE DUTY FIRECLAY BRICK: *A fireclay brick conforming to one of the following requirements—P. C. E. not lower than Cone No. 29, or not more than 3% deformation in the 2460° F. load test.

JAMB: The vertical or upright structural member forming the side of door or other opening in a furnace wall. (See "Lintel".)

KYANITE: A silicate of alumina which alters to mullite and free silica at temperatures ranging from 2010° F. to 2570° F. This alteration is accompanied by considerable volume expansion.

LINTEL: A horizontal structural member spanning an opening to carry a super-structure.

LOAD BEARING RESISTANCE: The resistance to deformation of fire-clay refractories when subjected to a specified compressive load at a specified temperature for a specified time.

LOSS ON IGNITION: *Loss in weight of a moisture-free sample during heating at 1652° F. to 1832° F.

LOW DUTY FIRECLAY BRICK: *A fireclay brick having a P.C.E. not lower than Cone No. 19.

MELTING POINT: The temperature at which a solid changes to a liquid. Most refractory materials have no true melting points, but soften gradually over a relatively wide range of temperatures. (See "Fusion Point" and "P.C.E.")

MODULUS OF RUPTURE: (Transverse or Cross-Breaking Strength.) The strength of a clay or refractory ware may be indicated numerically in pounds per square inch. This value is the tensile stress in the extreme fibers of the specimen under test just as breaking occurs.

MONOLITHIC LINING: A lining made in very large wall sections, without the customary layers and joints of a brick wall. Usually made by tamping or casting refractory material into place, drying it and then burning it in place on the job.

MORTAR: A combination of fine-grained refractory materials which, upon mixing with water, develops a plasticity that makes it suitable for spreading easily with a trowel or for dipping and adhering to brick.

MULLITE: A silicate of alumina containing 71.8% alumina and 28.2% silica. This mineral is formed when any of the alumina silicate minerals are subjected to sufficient heat treatment. It is resistant to corrosion at high temperatures and promotes a bond in the brick due to its crystalline growth.

NEUTRAL REFRACTORY: A material which is not affected appreciably by the corrosive action of either basic or acidic substances at high temperatures.

NINE-INCH EQUIVALENT: A trade term used in the Refractories Industry to describe the unit of volume measurement. It is the volume of a standard 9"x4½"x2½" straight brick. Volume of large refractory shapes is expressed by the corresponding quantity of "Nine-inch Equivalent".

NODULAR FIRECLAY: *A rock containing aluminous or ferruginous nodules, or both, bonded by fireclay. In some districts such clays are called "burley" or "burley flint" clays.

PERMEABILITY: The property of permitting the passage of liquids or gases through a body. It is measured by determining the rate at which some standard fluid, generally water or air, flows through a specimen of known dimensions under a definite fluid pressure head.

PLASTIC FIREBRICK: A mixture of plastic fireclay and calcined refractory minerals so processed that the substance can be used for monolithic construction.

PLASTIC FIRECLAY: *A fireclay of sufficient natural plasticity to bond non-plastic materials.

(*) Standard Definition furnished by American Society for Testing Materials.

PLASTICITY: The ability of a material to be molded or shaped easily by flowing smoothly and evenly under moderate pressure. Frequently judged by the ability of a material to retain a change in shape resulting from application of pressure.

POROSITY (APPARENT): The ratio of the volume of pores to the total volume of a substance. The apparent porosity is expressed as the volume of open pores which are permeable to water and does not include sealed pores within the brick.

PYROMETRIC CONE EQUIVALENT (P.C.E.): An index to the refractoriness of a material obtained by a test which provides the number of a Standard Pyrometric Cone that is closest in its bending behavior to that of a pyrometric cone made of the material when both cones are heated at a prescribed rate to the necessary temperature.

QUARTZITE: A quartz sandstone, formed by the deposition of secondary silica between the original grains so that the rock is more firmly cemented and less porous than before and tends to break across the grains. The stone is massive and the individual quartz grains cannot be readily recognized by the naked eye. The primary raw material used in the production of silica brick.

REFRACTORIES: The group of refractory products which have a high resistance to fusion and which are used in lining all types of industrial furnaces. They are called upon to resist the destructive forces of combustion such as abrasion, slagging, and spalling; other characteristics are load-bearing ability, low porosity and low shrinkage.

REFRACTORINESS: The capacity of a material to resist high temperatures.

REFRACTORY: A combination of materials which will withstand the action of various disintegrating agencies at high temperatures. It is usually assumed that the materials must have a P.C.E. of Cone No. 19 or higher.

REFRACTORY SPECIALTIES: Those refractory products, other than fireclay, firebrick and special shapes, such as high temperature mortars, cements, castables, plastics, and coating materials.

REHEAT: Heating of a refractory article in a test furnace in order to observe reactions of shrinkage or expansion or other results to be expected under service conditions.

RETAINING WALL: In furnace construction, the wall built adjacent to a plastic refractory lining for the purpose of keeping it in place.

RISE OF THE ARCH: The vertical distance between the crown and a horizontal line joining the skew-backs, heel or starting point of an arch.

ROWLOCK COURSE: A course in which the individual brick are laid or set on the 2½"x 9" edge with the 4½"x 2½" end of the brick showing in the surface of the wall.

SECONDARY EXPANSION: (Reheat-expansion.) An increase in volume of a refractory occurring during reheat. Secondary expansion is the result of one or a combination of the following phenomena: Development of a vesicular bubble-like structure, opening of the laminations of the clay particles, or changes in the crystalline forms during reheat which yields new crystalline forms of lower true density than the initial forms.

SEMI-FLINT CLAY: A hard clay, considerably softer than the true flint. It develops some plasticity upon weathering, or upon grinding in contact with water.

SEMI-PLASTIC FIRECLAY: A clay which has considerable natural plasticity, but which cannot be classified as a plastic fireclay. It is plastic enough so that it can be formed readily into brick. It has the ability to bond small amounts of non-plastic materials.

SILICA: The oxide of silicon, SiO_2 the most abundant of all metallic oxides. Practically all rocks contain silica in some proportion, either free or combined.

SILICA BRICK: Bonded ganister or silica rock, employed in the form of brick and shapes which, during manufacture, are fired with the result that the ganister is converted to tridymite and cristobalite. Used in contact with acid slags or where resistance to deformation at high temperatures is required.

SILICA FIRECLAY: *A refractory mortar consisting of a finely ground mixture of quartzite, silica brick, and fireclay of various proportions.
Note: Sometimes called "silica cement" by the trade.

SILLIMANITE: A silicate of alumina which alters to mullite and free silica at temperatures ranging from 2820° F. to 2960° F. This alteration is accompanied by a slight volume expansion.

SKEWBACK: The course of brick, having an inclined face, from

(*) Standard Definition furnished by American Society for Testing Materials.

which an arch is sprung; also the iron or steel work which supports such a course of brick, and which resists the thrust of the arch.

SLAG: A product formed by fusion and chemical reaction of two or more substances. Refractories must resist various types of slag —that resulting during smelting and/or metal refining operations, that resulting from uncombustible elements in oil and coal firing and that resulting from attack by fluxes in heavy chemical industries.

SLAGGING: Destructive chemical reaction between refractories and external fluxing substances at high temperatures resulting in the formation of a liquid slag.

SLAKING: The disintegration of dry clay when immersed in water.

SOFTENING POINT: See "Fusion-Point", "Melting Point", and "Pyrometric Cone Equavalent".

SOLDIER COURSE: A course in which the individual brick are laid or set on the 2½"x 4½" end with the 2½"x 9" edge showing in the surface of the wall.

SPALLING OF REFRACTORIES: *The breaking or crushing of a refractory unit, due to thermal, mechanical or structural causes, presenting newly exposed surfaces of the residual mass.

SPECIFIC GRAVITY: The ratio of weight in air of a given volume or the material at a stated temperature to the weight in air of an equal volume of distilled water at the same stated temperature.

SPECIFIC HEAT: The ratio of the thermal capacity of a substance to the termal capacity of water. Thermal capacity being the amount of heat required, in calories or British Thermal Unit, to raise a unit weight of a substance one degree in temperature (Centigrade or Fahrenheit).

STIFF MUD PROCESS: A method for manufacturing refractory brick which consists of extruding a column of clay thru an auger machine, cutting to suitable size, and usually repressing to reshape and brand.

STRETCHER; STRETCHER COURSE: A stretcher is a brick laid flat, that is, on its largest surface, with longest dimension parallel to the face of the wall. A stretcher course is a course of brick all laid in this way.

SUPER-DUTY FIREBRICK: *A fireclay brick having a P.C.E. not lower than Cone 33 on the fired product; not more than 1% linear shrinkage in the change test, schedule C (2910° F., 1600° C.); and not more than 4% loss in the panel spalling test (preheated at 3000° F., 1650° C.)

SUSPENDED ARCH: A roof or ceiling of a furnace which is not self-supporting but which is hung from a structure above.

SUSPENDED WALL: A furnace wall which is anchored to and has its weight transferred to a structure (usually steel work and castings) outside of the high temperature zone. Suspended walls are of two types: air-cooled—where there is a lane for the flow of air directly in back of the refractory; and insulated—where insulation is placed directly behind the refractory. Both the air lane and the insulation serve to protect the metal structure from the high temperatures.

THERMAL CONDUCTIVITY: The specific rate of heat flow through a material or wall usually measured in B.T.U. The number of B.T.U. transmitted through a material or wall per square foot, per hour, per inch thickness per degree Fahrenheit.

THERMAL EXPANSION: The temporary increase in volume or in linear dimensions shown by practically all materials when heated. Such expansion is of a temporary character, as the material returns to its original dimensions when cooled. The "coefficient of linear expansion" is the expansion per degree Centigrade or Fahrenheit per unit of length.

VISCOSITY: All liquids have a definite resistance to change of shape, which is known as viscosity. A liquid that flows slowly when poured from a container has higher viscosity than a second liquid that flows rapidly when poured in the same manner.

VITRIFICATION: A condition of partial fusion in which the pore space is small and the volume is near a minimum. This is a relative term describing the gradual development of glass in a ceramic body. With the development of glass there is a loss of physical texture as grain structure, and a re-arrangement of mineral composition. It is a result of time and temperature and may be thought of as a result of "heat-work" on the ceramic body.

WOOD MOLD PROCESS: A manual method of forming brick from a high moisture content soft plastic mass in suitable molds usually made from wood. (The molds are often lined with steel.)

WORKABILITY: The term used to describe the quality of plasticity with which a wet mortar or plastic firebrick is endowed.

(*) Standard Definition furnished by American Society for Testing Materials.

GUARANTEES

Since we do not have control over the actual use of our refractory products after they are received and go into service, no performance guarantee of any kind can be made. Extreme care is used in every phase of production in order to furnish only high quality materials.

ALLOWABLE SIZE DEVIATIONS

When tested in accordance with Standard Method C-134 of the American Society for Testing Materials, a nine-inch standard brick shall not show a size variation of more than plus or minus 2%. Tile or shapes shall not show a size variation of more than plus or minus 2% on dimensions of four inches or over and plus or minus 3% on dimensions smaller than four inches.

ALLOWABLE WARPAGE

Ninety-five per cent of the tile or shapes shall not show a warpage greater than 1% of the diagonal measured when tested in accordance with A.S.T.M. Standard Method C-154.

OVERSHIPMENTS ALLOWABLE ON NON-STANDARD SHAPES

It is generally necessary to make a few "overs" in the manufacture of special shapes and the overages as listed below will be allowable on shipments that are not standard unless specified to the contrary:

Quantity Specified	Overages Allowed	Quantity Specified	Overages Allowed
1-10	1 piece	751-1500	4%
11-100	10%	1501-5000	3%
101-250	7%	5001-10000	2%
251-750	5%	Over 10000	1%

INSTRUCTIONS FOR ORDERING

It is suggested your refractory requirements be anticipated as far ahead as possible. Three to five weeks are generally needed to make special shapes while stock material can be shipped promptly. In ordering a minimum weight car of materials, one item should be indicated which may be increased if necessary to make the required weight.

Orders should contain the following information:

1. Description of each item including complete dimensions.
2. Brand and type of brick.
3. If special shapes, advise if they have been made before, and give order number on which they were furnished or send blue prints.
4. Exact rail or truck destination instructions. Complete information will expedite handling and shipping. .
5. Give all important information as to billing and the number of invoices and shipping notices required with the addresses to which they should be sent

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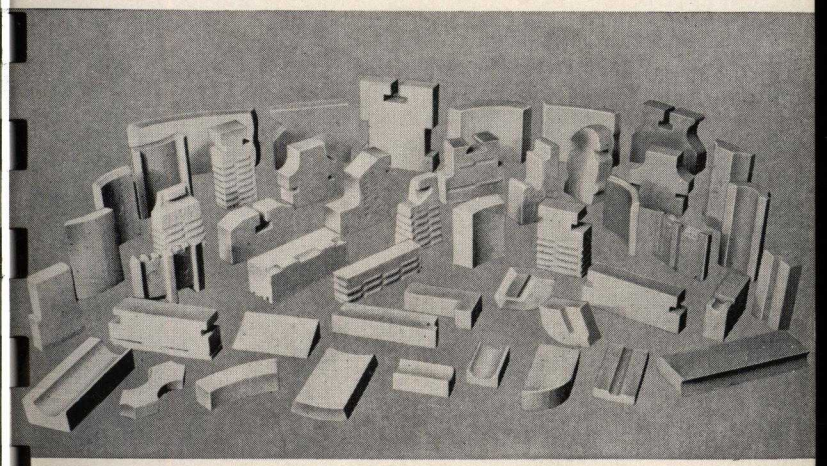
BETTER

MEX-R-CO

REFRACTORIES

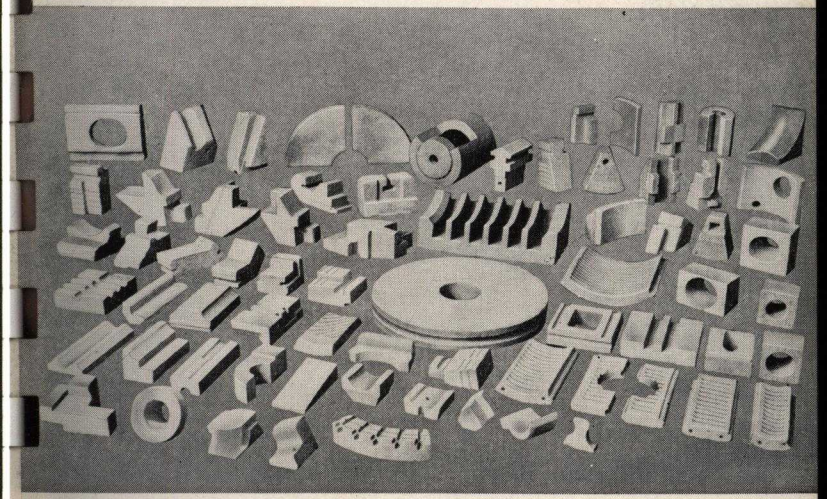
DRY PRESS TILE

meet exacting specifications for uniformity in size



HAND MADE TILE

to meet the needs of more complex furnace construction



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